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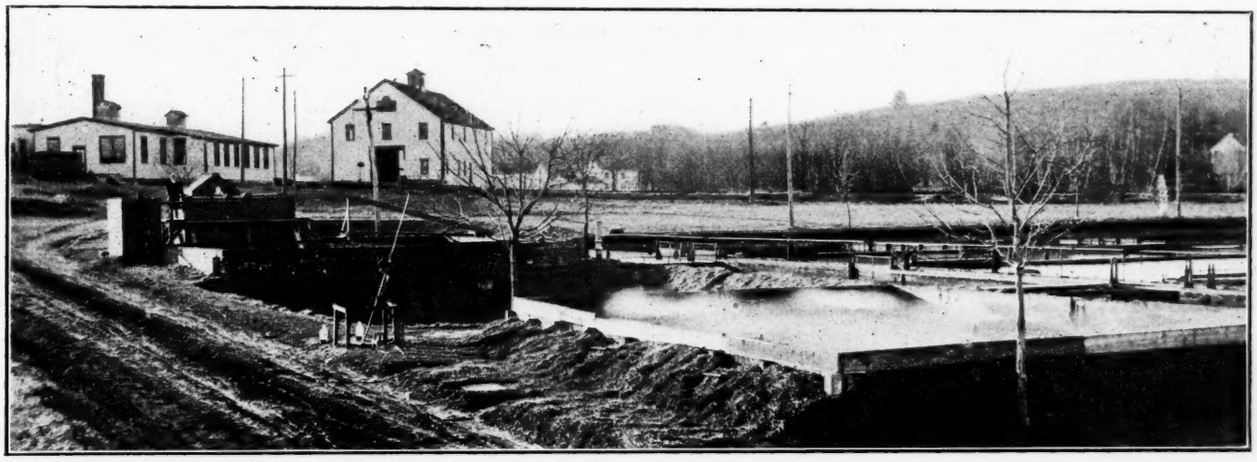


VIEW OF SPRINKLER FILTERS IN OPERATION.

WORCESTER'S SEWERAGE AND SEWAGE DISPOSAL

Municipal Force for Construction and Maintenance—Operation of Sand Filters—Experiments with Emscher Tank and Deep Sprinkling Filters—Results Obtained—Sewerage Statistics Arranged in Standard Form

THE work of the Sewerage Department of Worcester, Mass., is perhaps as interesting as that of any city in the country, and it is fortunate that the superintendent of the department recognizes the benefit which he can confer upon the citizens and upon other superintendents and engineers of sewerage work by preparing an exceedingly comprehensive and informative report each year. From his report for the year ending November 30, 1911, we abstract the following as some of the more important and interesting items.

Considerable of the construction as well as maintenance work is done by the Sewer Department with its own laborers, and the department is well equipped with tools and machinery adapted to this work and with experienced foremen. It aims to take advantage of improved methods and machinery in order to keep the efficiency of the work at the highest point and with that end in view it spent several thousand dollars during the year for new equipment. For the advantage of the department, as well as for the best interests of the skilled laborers which it employs, it seems a wise policy to keep as many of the latter at work through the winter as is consistent with economy. With that end in view, the department has, during the past three winters, constructed sewers in rock trenches, using a gang of 35 or 40 men. In addition to these, men were employed throughout the year at the purification plant and at the yard, and a considerable amount of the sewer cleaning is done during the winter; the combined force on all this winter work totaling about 110. The maximum number of men used during the year was 295, employed for the week ending October 13, and the minimum was 109 during the week ending February 24. The average number from April 1 to December 1 was 234. The minimum wage for a day of eight hours was $1.85, and the average wage per week for all employes was $11.31.

The sewer system of the city includes about 205½ miles of sewers, 7,346 manholes and 3,322 catch basins. In some of the low lying sections it is necessary to pump the sewage, and Shone ejectors are used in several instances for this purpose. Some of the sewers were constructed 30 years or more ago, and more or less repair work is required on these from year to year. Last year one large brick sewer, the brick originally used in which were rather soft and had become badly worn, was repaired by supplying a smooth invert of concrete. The work was done in sections of about 200 feet, a trough made up of short sec-

tions being put in to carry the flow of sewage. The sections of the trough were securely fastened together, and the whole was firmly anchored to prevent their being carried away in case of flood and blocking the sewer lower down. The invert was made of rich concrete which insured both a smooth surface and more rapid setting.

As stated, most of the cleaning is done in the winter months. Last year 635 cubic yards were removed from the sewers, 117 from regulators and 16,768 cubic yards from catch basins. The cost of cleaning the catch basins was $11,639.68, and that of cleaning the sewers was $4,532.59. This is an average of $3.50 per catch basin per year, or 69½ cents per cubic yard of material removed from them; also an average of $7.14 per cubic yard removed from the sewers.

During the year work was commenced on a 72-inch circular concrete sewer for which concrete was used mixed 1:2½:5, Mr. Gault stating: "Our long experience with concrete at our purification plant convinces us that we are safe in using this material for a main trunk sewer." Conditions seemed to be unusually favorable for concrete in this case, as an abundance of the very best sand was found in the trench, as was also more than one-half of the stone required. Blaw centers were used in this work. The trench was 23 feet deep. Work was begun in June and continued until the middle of January, steam being used for thawing the surface frost and heating the sand and stone for the concrete. No work was done in extending the sand filters last year, and it is not intended to construct any more of these; the reasons for this being the small amount of available sand remaining, the cost of construction, the heavy maintenance cost, and the large area of beds that would be required to treat the whole volume of sewage. For five years past the department has been experimenting with sprinkling filters and is convinced that this process offers many advantages over sand filters for treating Worcester sewage. Fortunately the plant is well located both as regards elevation and remoteness from dwellings for the location of a large sprinkling filter plant. A 24-foot head is available between the surface of the settling basins and the stream which receives the effluent.

On reaching the disposal plant the sewage passes through grit chambers, the velocity varying from 0.2 to 0.7 foot per second and averaging approximately 0.5 foot. During the past year approximately 640 cubic yards of deposit have been removed from the grit chambers, which amount is equivalent to 0.12 cubic yards per million gallons of sewage. The cost of shoveling this three times and hauling it by carts 600 feet to nearby points has averaged about 40 cents per cubic yard. The deposit gives off an extremely offensive odor and requires covering in order to prevent a nuisance. (This offensiveness is probably due to the deposit of organic matter in the grit chambers, which is permitted by the velocity which is less than that for which modern plants are ordinarily designed.)

The strongest of the sewage is run upon the sand filters at the average rate of 67,000 gallons per acre per day. During the year 73 acres of filters have been available. Preliminary to filtration the sewage is passed through one of two precipitation basins, in which a period of about 30 minutes is allowed for sedimentation, during which the coarsest and heaviest of the suspended matters, amounting to about 30 per cent. of the whole, are precipitated. During the year a total of 1,206 tons of solids were removed in this way. The filters, as a rule, were dosed from one to four times a week, the amount of a single dose varying from 300,000 to 500,000 gallons per acre. The total purification obtained by this treatment averages 86.1 per cent. measured by the albumenoid ammonia. The accumulation upon the surface of the filter which was removed from the filters last spring amounted to 250 cubic yards per acre, or 10.2 cubic yards per million gallons of sewage filtered. This material is raked up late in the fall into small piles about four feet apart, which are left during the winter to assist in supporting the ice above the surface of the filter, which practice prevents any difficulty in operating the filters during severe weather. In the spring the surface of the beds is again scraped and the entire accumulation is removed to the nearest dump. The total cost of cleaning the beds was 30.3 cents per cubic yard, of which 30 per cent. was for teams, the average length of haul being about 800 feet. The sewage which is not filtered is treated by chemical precipitation.

Arrangements have been completed whereby the principal manufacturing wastes may be held in storage at the factories and their admission into the sewers controlled. This scheme will not only aid in the efficiency of chemical precipitation, but by doing away with the heavy doses of acid-iron waste and distributing it more uniformly throughout the day bacterial purification should be greatly facilitated.

The experimental plant for treating a small part of the sewage on sprinkling filters has already been described in our issue of August 30, 1911. A 5-foot sprinkling filter was in continuous operation during the year, except between December 28 and January 7, and between May 31 and June 9, the sewage being applied at the rate of one million gallons per acre per day. During the former intermission the nozzles were changed from the Taylor to the Worcester-Columbus type. During the latter intermission an experimental Imhoff tank and 10-foot sprinkling filters were installed.

Chemical effluent was led from one of the precipitation tanks to a dosing tank, which was built in the form of an inverted pyramid to aid in securing a more uniform distribution, the head varying from 5 feet to nothing, and the tank being operated by a Miller siphon. Prior to June, when the area of the bed was reduced, this dosing tank was filled in approximately 11 minutes and 25 seconds, and required 3 minutes and 35 seconds to empty. Subsequently 17 minutes and 6 seconds were required to fill the tank and 6 minutes and 34 seconds to empty it.

Considerable trouble was experienced in the clogging of the valve and nozzle orifices by bits of fatty substance, which was carried under the scum board. A wire screen of one-quarter-inch mesh placed over the end of the pipe overcame this difficulty to a large extent. This screen was cleaned once a day, although it was not always necessary to do so.

During cold weather a coating of carbonate of lime was formed upon everything with which the chemical effluent came in contact. This deposit did not clog the filters, but its presence was often detected by the crystals glistening in the sunlight. When the bed was allowed to dry, the coating on the stone took the form of a fine white powder. The sprinkler nozzles had to be cleaned frequently, and in zero weather the orifice was reduced from three-eighths of an inch to one-quarter of an inch in less than 24 hours. When the temperature was above 10 degrees F. comparatively little trouble was experienced from this source.

During October and November, 1910, this filter was dosed at the rate of two million gallons per acre daily, but even as late as December 1, there was very little purification, and the rate was cut down to one million gallons. Considerable improvement was shown, which was increased in January, when Worcester-Columbus nozzles were substituted for the Taylor nozzles previously used. The effluent then became uniformly non-putrescible when mixed with an equal volume of tap water, and about one-half of the undiluted samples retained the color of methylene blue for the full period of 14 days when allowed to stand in closed bottles at room temperature. Upon the advent of warmer weather still further improvement was shown, but it was obvious that the rate could not be in-

creased very materially and still produce a satisfactory effluent,

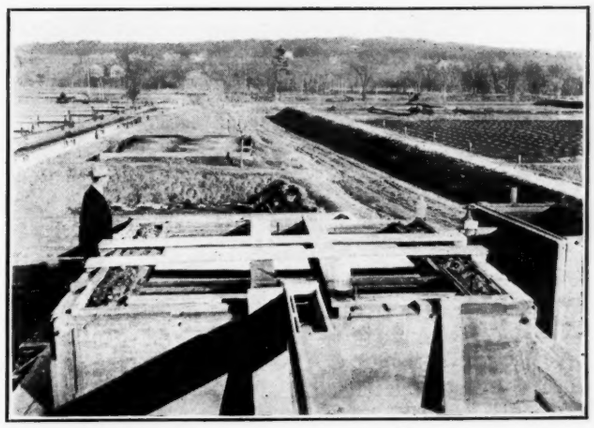
During the year the purification, measured by albumenoid ammonia, ranged from 39 per cent. in winter to 69 per cent. in summer; free ammonia from 7 per cent. in winter to 64 per cent. in summer, and dissolved oxygen did not average less than 50 per cent. saturation in any month except one. During the first few months there was an actual increase in the bacterial count of the effluent over that of the influent, but in summer as high as 91 per cent. removal of bacteria was obtained.

During the year previous to the one covered by this report the same filter had operated with settled sewage at the rate of 700,000 gallons per acre. While the suspended matters in the chemical effluent are considerably less than in the settled sewage, the dissolved matters are higher. There was a higher percentage removal of organic matter when treating chemical effluent, but the final effluent from the settled sewage contained a less amount of organic matter. The nitrogen as nitrates and nitrites are somewhat higher in the final effluent from the chemical effluent, but the increase in nitrified nitrogen was greater in the effluent from the settled sewage. The average percentage of removal of bacteria was nearly the same in both cases, although the original number was nearly three times as great in the chemical effluent. The percentage of effluent samples which were non-putrescible was practically the same in both cases.

The experiments indicate that about 30 per cent. more chemical effluent than of settled sewage may be applied to a 5-foot sprinkling filter with like results. The results obtained by the treatment of chemical effluent on the 5-foot filter were decidedly inferior to those obtained by the treatment of settled sewage on a 7½-foot filter operating at the same rate. In spite of the increased rate of chemical effluent, the increase in rate is more than offset by the extra cost of preliminary treatment.

As the topography of the plant would permit the use of 10-foot filters, it was desired to ascertain the efficiency of these; accordingly two 10-foot sprinkler filters were constructed, each having approximately 550 square feet of area. The filter stone used in these was from three-quarters of an inch to 2½ inches in size in one bed, and from one-half an inch to 1½ inches in the other. The voids in the former were found to be 45.6 per cent. and in the latter 43.7 per cent.

The sewage applied to these 10-foot filters is the effluent from an Imhoff tank, the plant thus arranged being completed and put into operation July 27. Sewage is taken



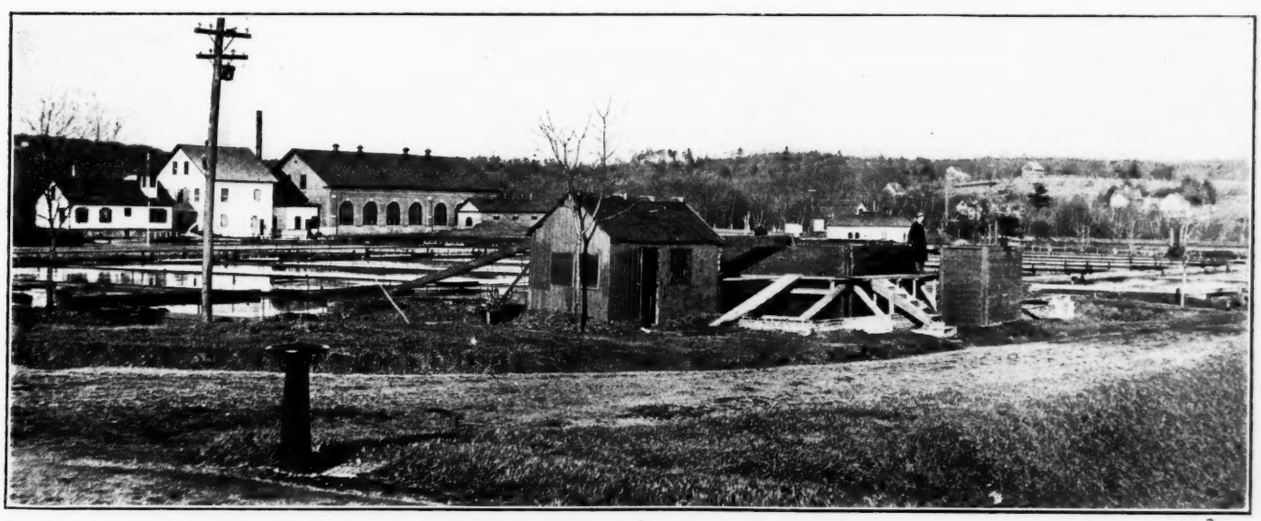
TOP OF IMHOFF TANK, DOSING TANK AND SPRINKLER FILTERS.
Sand filter at right, hilled up for winter.

from the outlet channel of the grit chambers through a 6-inch pipe provided with a gate to control the flow. This pipe conducts the sewage 750 feet to the screen chamber, which is of brick 2½ feet square and 3 feet deep. The screen is made of bars of iron one-quarter of an inch thick and one-half an inch apart set at an angle of 60 degrees with the horizontal. The working area of the screen is approximately 3.75 square feet. The screen is raked once an hour and the screenings are carefully measured before they are taken to the dump.

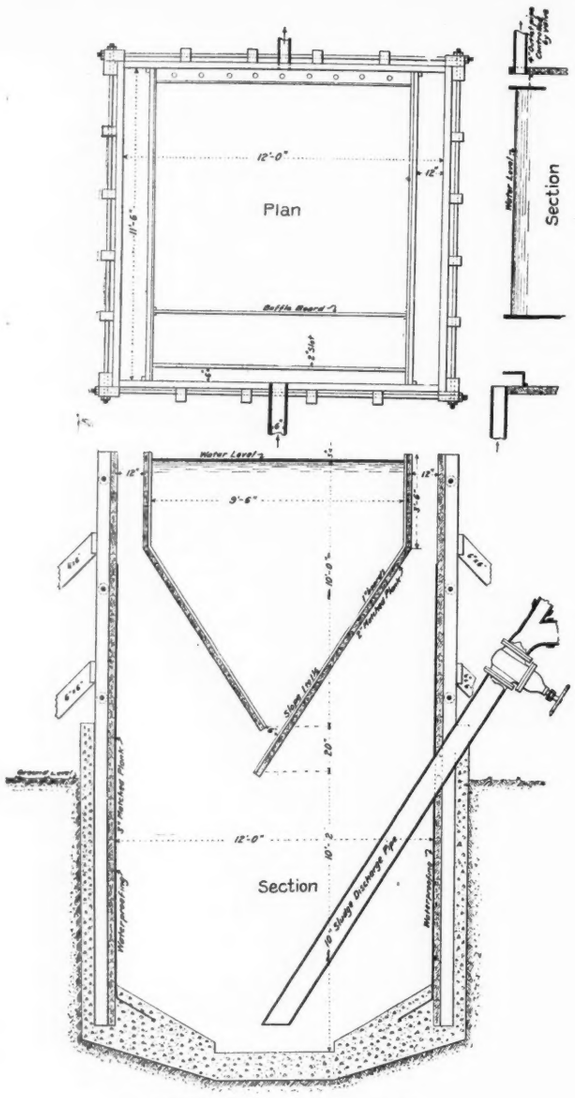
From the screen chamber the sewage passes to the pump well. As an additional safeguard for the pump a cage screen 1 foot square and 16 inches deep, with 1½-inch mesh is fitted over the mouth of the supply pipe. This screen is cleaned once a week. The sewage is lifted approximately 8 1-3 feet by a 2-inch centrifugal pump run by a one-horse power constant speed motor, the current for which is supplied by the Worcester Electric Light Company. This pump has a capacity of 50 gallons per minute. It delivers the sewage through a trough into the Imhoff tank. This trough is provided with a swivel gate so arranged as to permit turning any or all of the sewage into a by-pass.

The Imhoff tank is approximately 12 feet square and 22 feet deep, constructed with a concrete bottom and walls of 3-inch matched plank reinforced at the bottom with an outer wall of concrete. To insure the tank being watertight, the inside was waterproofed with tar and tarred paper up to within 5 feet of the top.

The sedimentation chamber is constructed within the



GENERAL VIEW OF EXPERIMENTAL IMHOFF TANK AND SPRINKLER FILTER.
Imhoff tank at right center; filter at extreme right; precipitation tank at the left.



EXPERIMENTAL IMHOFF TANK.

large tank, the east and west walls of which serve for walls of the sedimentation chamber also. The north and south walls are approximately 1 foot inside the corresponding walls of the larger talk. These walls extend down vertically to 3½ feet from the top of the tank and are then inclined inwards at an angle of about 60 degrees with the horizontal, leaving an open slot at the bottom 6 inches wide; the south wall extending approximately 2 feet further than the north wall so as to deflect the rising gases and sludge ebullitions so that they will not enter the sedimentation chamber. The sedimentation chamber is approximately 12 feet long, 9½ feet wide at the top and 10 feet deep through the middle. The total capacity is approximately 5,000 gallons. It is such a size that the period of sedimentation will range from two to four hours, according to the rate at which the sprinkling filters are operated.

The sewage from the inlet trough falls into a distributing trough extending across the west end of the chamber and passes into the tank through vertical slots 1½ inches wide. About 2 feet from the distributing trough is a baffle board extending 2 feet 9 inches below the operating level. The collecting trough for the tank effluent extends across the east end of the chamber, and is provided with small holes along the bottom to admit the effluent. The inside board of this trough serves as a scum board. The effluent is conducted to the dosing tank through a 4-inch iron pipe provided with a valve to assist in regulating the flow.

The sludge compartment was designed to hold the sludge from six months' operation of the tank. The total capacity up to the slot is roughly 10,000 gallons. The bottom slopes to a shallow well at the center. The end of the sludge pipe is set about 1 foot above the bottom at the center and extends, at an angle of about 45 degrees, through the south wall of the tank. This pipe is 10 inches in diameter and is provided with a gate on the outside of the tank. The sludge will be forced out through this pipe under a head of approximately 6 feet and conducted through a branch pipe to a portion of one of the sand filter beds reserved for this purpose.

The dosing tank is of concrete and is tapered so as to give more uniform distribution on the sprinkler filters. A 5-inch Miller siphon is used, designed to draw 6 feet. It was found by calibration that the dosing tank holds approximately 360 gallons. At the rate at which the sprinkler filters are likely to be operated, this tank will require 10 to 20 minutes to fill. The effluent is conducted through an 8-inch pipe to the sprinkler filters.

The final settling tanks or humus tanks are each approximately 14 feet long, 7 feet wide and 4 feet deep at the inlet and 3 feet at the outlet end. The capacity of each is about 2,500 gallons. Since the sludge may be allowed to accumulate until the tank is one-half filled, the average working capacity may be not over 1,875 gallons. The tanks were designed to give from one to three hours' sedimentation, according to the rate of operation of the sprinkling filters.

In the case of each filter, the effluent from the main underdrain is conducted to a distributing trough extending across the upper end of the humus tank and provided with vertical slots 1½ inches wide spaced at regular intervals. A baffle board is placed about 2 feet from the inlet end and projects about 15 inches below the operating level. The effluent is collected in a corresponding trough extending across the lower end of the tank by means of one-inch holes along the bottom. The final effluent is conducted to a well, whence it flows through a pipe into one of the main underdrains of the sand filter beds. Provision is made for collecting samples as the effluent falls into the well.

A suitable portion of the adjacent sand filter bed will be utilized for drying out the humus.

The entire experimental plant had been in operation almost continuously for four months. It was shut down for six or seven hours on three different days while the Electric Light Company were changing poles and for a few hours on two or three days to lower the water for outfall sewer construction. The plant was also shut down a few hours September 16 and again October 26, while cleaning the humus tanks. The siphon was out of order for 22 hours on September 4, and the plant was idle for 34 hours September 26 to 28, owing to trouble with the motor, and eight hours September 29, owing to a broken gear.

The average flow through the supply pipe has been estimated at 85 gallons per minute, or 122,500 gallons per day. A total of 4.8 cubic yards of screening have been removed from the sewage, an average of 8.6 cubic feet per million gallons of sewage. The amount of screenings collected has varied greatly, depending, in part, on the depth to which deposit was allowed to fill the grit chambers. When the chambers were empty, the screenings were less than 5 cubic feet per million gallons of sewage.

The pump delivers 72,000 gallons of sewage in 24 hours. The total quantity of sewage pumped has amounted to 8,900,000 gallons. Of this amount 4,200,000 gallons have been passed through the Imhoff tank, the remainder being turned into the waste trough. The cost of power for pumping has averaged between 30 and 35 cents per day.

The period of sedimentation in the Imhoff tank depends upon the rate at which the sprinkler filters are operated.

This has varied from 4.5 hours at the beginning to 3.3 hours toward the close of the period, averaging approximately 3.5 hours for the entire period. During the times when the plant was shut down for several hours, the sedimentation chamber showed evidences of a septic condition. Normally, the tank effluent appeared to be fairly fresh. There was never any evidence of gas ebullition within the sedimentation chamber and no scum formation save for floating greasy substance which eventually became water-logged and sank through the slot. It has not been necessary to clean the walls of this chamber. Sludge scum appeared at the surface of the sludge chamber within a week after starting the tank and increased in thickness from time to time to a maximum of 3 feet. There was considerable variation in the depth of scum at different times, doubtless due in a large measure to the alternative confinement and liberation of gas. Usually, after a rain storm or heavy winds the scum was decreased in amount. There is only a small section of what could be called permanent scum. None of the scum has been removed and there has been no attempt to cause it to settle again. When it was stirred up for examination and measurements, much gas was liberated and portions of the scum sank. The ebullition of gas was very noticeable.

The amount of sludge was measured towards the close of this period and it was found that the sludge compartment was a little more than two-thirds full. Samples of this sludge at different depths were siphoned off and examined. The bottom sludge was of a thick consistency, although it flowed freely. It was intensely black in color and finely divided except for bits of hair. It had a decidedly tarry odor, doubtless due to the gases contained therein. On standing in a glass cylinder, the solids were carried to the top by the escaping gases and the water was left underneath. When the gas had largely escaped the sludge had a slight odor like cow-manure. This odor was not very offensive and was not noticeable at a distance. Some of this sludge will be drawn onto the sludge-drying bed before winter sets in.

From July 26 to August 11 the sprinkler filters were operated at the rate of approximately 900,000 gallons per acre daily on the average working area 10 feet deep. For the first few days the filters appeared to act merely as strainers, but during the second week the effluents became clear and colorless and non-putrescible. On August 11 the rate was increased to 1,000,000 gallons per acre daily, and the effluents continued to be satisfactory. On August 19 the rate was increased to 1,200,000 gallons. The effluent continued non-putrescible but often showed a trace of the dark color due to tannery and iron wastes. On September 1 the rate was further increased to 1,300,000 gallons. The effluent samples continued to retain the color of the methylene blue for the full period of 14 days, with the exception of two samples from one of the filters, which held the color more than a week. On October 10 the rate was still further increased to 1,500,000 gallons per acre daily. The effluents continued uniformly non-putrescible but showed considerable color when excessive quantities of tannery waste were present in the sewage. Owing to the approach of cooler weather it was not attempted to further increase the rate of application.

The cycle of operation of the dosing tank is approximately 28 minutes. At the average rate of operation, about 15 minutes was required to fill the dosing tank, during which time the filters were at rest, and about 13 minutes to empty it, during which time the sprinklers were in operation.

The sludge removed from the humus tanks was of a thick, gelatinous consistency and dark in color. It had a disagreeable fishy odor when first removed, probably due either to decaying growth or to decomposing fish worms or to both of these causes. This odor was not noticeable a short distance from the drying bed. Owing to the gelatinous nature of this sludge, it dried out very slowly. When spread out in a thin layer about 3 inches thick, it was dry enough to shovel up in about 10 days of favorable weather. Analyses of the humus sludge have not been completed.

The average results obtained from the experimental plant during the first four months of operation showed the total purification effected by the entire plant, measured by albuminoid ammonia, to amount to 63 per cent. of the dissolved organic matter, 89 per cent. of the suspended organic matter and 78 per cent. of the total organic matter. On the whole, the experimental plant is giving good satisfaction.

Partly to show in condensed form the important features of the Worcester sewerage system and disposal plant, but principally to present the form adopted as a standard by the Boston Society of Civil Engineers and to illustrate its use, we give below the Worcester data arranged according to this form.

SUMMARY OF SEWERAGE STATISTICS

(In form recommended by Sanitary Section of Boston Society of Civil Engineers.)

For the year ending November 30, 1911, Worcester, Mass.

GENERAL

Population by census of 1910, 145,986.

Total area of city or town, 38.42 square miles.

Area served by sewerage system, 7.75 square miles.

Collection system: For sewage only, 88.380 miles; for sewage and surface water, 65.779 miles; for surface water only, 51.163 miles.

Method of disposal: Partly chemical precipitation and partly sand filtration.

COLLECTION

Mains (everything but house and catch basin connections).

		For sewage only.	For sewage and surface water.	For surface water only.
1.	Miles stone	....	.109	3.119
2.	Miles brick	13.62	18.646	10.72
3.	Miles concrete	....	.712	1.694
4.	Miles pipe	74.760	46.312	35.630
5.	Miles extended during year	3.316	.785	2.560
6.	Number of inverted siphons	7	6	....
7.	Number of manholes	7,238 (All kinds)		

8. Method of flushing: Partly by 2½-inch fire hose attached to hydrants three times a year, partly by direct connection to water mains.

9. Method of cleaning: In large sewers a sectional track is laid and pails of silt carried to manholes and hoisted. In smaller sewers scrapers are pulled through by men, horses or hoisting engines, as circumstances may require.

		For sewage only.	For sewage and surface water.	For surface water only.
10.	Number of automatic flushing tanks	8	2	....
11.	Number of direct connections with water mains for flushing	28	55	....
12.	Number of flushings of entire system during year	2	(Of all kinds)	
13.	Cost of flushing per mile	$3.35	....	....
14.	Number of miles cleaned	88.380	65.779	51.163
15.	Cost of cleaning	$22.08	....	....
16.	Number of stoppages	None	....	....
17.	Miles of permanent underdrains	2.2	(On all lines)	
18.	Number of storm overflows	34	....	....

19. Method of ventilation: By perforated covers on manholes.

20. Cost of maintaining sewer system, exclusive of disposal works (including cost of flushing and cleaning sewers, cost of cleaning catch-basins and unclassified expense), $29,729.91.

HOUSE CONNECTIONS

21. By whom made? By licensed drain layers.

		For sewage only.	For sewage and surface water.	For surface water only.
22.	Sizes	6"	6"	6"
23.	Number made during year	490	†	126
24.	Lineal feet laid during year	30,225.3	....	7,656.8
25.	Lineal feet discontinued during year.			
26.	Total miles in use	145.45	(All kinds)	

27. Average cost per ft., connections made during year, 50c. (all kinds).

28. Number of stoppages coming to attention of department, 4.

† All surface water is required to pass through separate drains even though discharged into combined sewers.

CATCH-BASINS

29. Number, 3,322.
30. Number cleaned, 7,035.
31. Average amount material removed per catch-basin per cleaning, 2.35 yards.
32. Cost of removing material per cubic yard, $0.694.
33. Cost of removing material per catch-basin per year, $3.69.

DISCHARGE OF SEWAGE

34. Estimated population using sewer system, 139,700.
35. Number of buildings connected. Not known.

	Average.	Maximum.	Minimum.
	Gallons.		
36. Daily discharge for year...	14,850,000	23,898,000	8,382,000
37. Daily discharge for each user	106.3	171.1	60.0
38. Daily quantity of factory waste. Unable to estimate.			
39. Daily leakage into sewers..	3,562,000	....	....
40. Daily leakage per mile of sewer	23,130	....	....

41. Are quantities given under 36 to 40 estimated or measured? 36, measured; 37, population estimated; 39 and 40, estimated.

PUMPING

42. Description of plants: 1, Gold street, submerged centrifugal pump, electric power; 2, Highlands, Shone ejector, one lift; 3, Lake View, Shone system, three lifts, compressors driven by electric motors; 4, Millbury avenue, two 12-h.p. gas engines operating two submerged centrifugal pumps.
43. Description of fuels or power used:
    - A. Coal.
        - (a) Kind.
        - (b) Brand.
        - (c) Avg. cost per gross ton delivered, $.....
        - (d) Percentage of ash.

        Average cost per gross ton delivered, $.....
    - B. Fuel for internal combustion engines.
        - (e) Kind and grade. Plant 4, motor gasoline 70°.
        - (f) Average cost, $0.12 per gallon.
    - C. Electricity.
        - (g) Average cost per kw. hour, $0.029.
44. Amount of fuel or power consumed for the year, ...
45. Total pumpage for year with or without allowance for slip, ... gallons.
46. Average static head against which pump works: Station 1, 9.5'; Station 2, 42.0'; Station 3, 180.0'; Station 4, 64'.
47. Average dynamic head against which pump works, ... feet.
48. Number of gallons raised 1 foot per unit of fuel or power, ...
49. Cost of pumping figured on pumping station expenses per million gallons raised 1 foot (dynamic), not including fixed charges, $.....
50. Describe screens: At Station 1, basket made of vertical rods, hoisted for cleaning. No screens at Stations 2 and 3. At Station 4, same as Station 1.

DISPOSAL

51. Number of tanks: Settling, 2; chemical precipitation, 14.
52. Total capacity of precipitation tanks up to flow line, 4.3 million gallons.
53. Average daily quantity of sewage treated by chemical precipitation, 9.89 million gallons.
54. Average length of time sewage remains in tanks, 7 hours.
55. Disposition of effluent. Discharged into Blackstone River.
56. Disposition of sludge. Pressed and cake hauled to dump; small proportion taken by farmers.
57. Volume of sludge produced per 1,000,000 gallons sewage (if this is not known give depth of sludge in tank when cleaned), 4,949 gallons.
58. How often are tanks emptied? 6 roughing 2 to 4 weeks; others 3 to 6 weeks.
59. Cost of plant, $265,628.75.
60. Cost of maintenance, including cost of disposing of sludge, $36,581.66.
61. Kinds and quantities of chemicals used per 1,000,000 gallons, 944 pounds lime; lime only used.

SEWAGE BEDS OR FILTERS

62. Type, intermittent sand filters. (Sprinkler filters for experiments.)
63. Date of construction of works, 1899 to 1911.
64. Cost of beds (not including land), $308,812.44.
65. Total net filtering area December 1, 1911, 74.3 acres.
66. Number of beds, 75.
67. Average area of beds, 0.99 acre.
68. Were loam and subsoil removed? Yes.
69. Character of filtering material (give effective size if available): Average—14 beds, 0.23 mm.; 9 beds, 0.16 mm.; 8 beds, 0.20 mm.; others not determined.
70. System of underdrains (depth, distance apart, etc.), 4 to 6 feet deep, 35 to 50 feet apart, open joints surrounded with cobbles.
71. Average daily quantity of sewage treated, 4,910,000 gallons.
72. Average daily quantity of sewage treated per acre (net area), 67,000 gallons.
73. Maximum daily quantity of sewage treated, 15,700,000 gallons.
74. Preliminary treatment: Passed through grit chamber, 40 feet x 10 feet x 10 feet, and settling tank, 40 feet wide x 166 2-3 feet long x 7 feet deep.
75. Dosing apparatus and size of dose, flow controlled by gate valves on main dikes and molasses gates at distributors.
76. How long does sewage flow on one bed? Two to six hours.
77. How often is each bed used? One to four times weekly.
78. Method of caring for surface of filters (number of times raked, harrowed, plowed, furrowed, etc.): Occasional raking of top half-inch with wire-tooth horse weeder; deposit raked up in the fall and again in the spring; deposit removed in the spring.
79. Cubic yards of material removed from surface of beds, 18,227.
80. Cost of removing same, $5,525.
81. Are crops raised, and if so, what kind? None.
82. Amount received for crops, $.....
83. Total cost of maintenance, $13,419.38.
84. Cost of maintenance per million gallons filtered, $7.49.
85. Water capacity of contact or trickling filters and decrease in same since plant was started, ...

FINANCIAL

CONSTRUCTION

Receipts.		Expenditures.	
86. Balance of previous year	$8,499.63	93. Collect'n works: (a) mains	$139,596.19
87. Bonds issued..	.....	(b) house connections	.....
88. Appropriation.	100,000.00	94. Disp'sal & purification wks.	15,976.53
89. Assessments ..	31,677.50	95. Balance	7,909.81
90. House connectns.	.....		
91. Other sources.	23,305.40		
92. Total	$163,482.53	96. Total	$163,482.53

MAINTENANCE AND OPERATION

Receipts.		Expenditures.	
97. Balance of previous year...	$762.30	103. Administration	$2,299.27
98. Appropriation.	80,500.00	104. Repairs*	9,551.66
99. Assessments ..	.....	105. Clean'g sewers	3,719.57
100. Rentals	.....	106. Cleaning catch-basins	12,262.91
101. Other sources.	5,216.42	107. Flush'g sewers.	687.26
		108. Pumping	4,213.06
		109. Disposal or purification**	50,257.35
		110. Unclassified expenses†	2,284.34
		111. Balance	1,203.30
102. Total	$86,478.72	112. Total	$86,478.72
		113. Interest on bonds	69,090.00
		114. Sinking fund..	59,264.00

GENERAL

115. Total cost of collecting mains.....	$5,326,354.09
116. Total cost of pumping system.....	32,855.69
117. Total cost of disposal works.....	808,464.48
118. Total cost of works to date††.....	$6,167,674.26
119. Bonded debt at date.....	1,908,000.00
120. Value of sinking fund at date.....	701,306.26

121. Average rate of interest on bonds, 3.7 per cent.
122. Proportion of cost of system assessed on abutters, 33 per cent.
123. Yearly assessment for maintenance, none.
124. Method of assessing abutters and rate of assessment: Front foot assessment, based on cost, ranges from 100 per cent. on inexpensive work to small percentage on expensive work. Average assessment $1 to $1.25 per foot on each side of street.

*Includes general repairing of sewers and manholes on same and catch-basins connected thereto.

**Including payment for maintenance of joint disposal works.

†Includes "maintenance of regulators," and "damages to clothing and property."

††Approximate.

CENSUS REPORT ON SEWERAGE

Data from All Cities of More Than Thirty Thousand Population—Amounts and Kinds of Sewers—Maintenance—Purification

The Bureau of the Census recently issued a preliminary statement drawn from the statistics of cities of over 30,000 population, collected in the year 1909. These were prepared under the direction of Le Grand Powers, chief statistician, and are subject to revision later. The same remarks as were made in our issue of April 18th concerning the census report on street cleaning will apply to these data also.

The Supervisory Authority.

In 145 of the 158 cities covered by the report the sewers and highways are under boards, departments, services, etc., usually having some such designation as "Board of Public Works," "Board of Public Service," "Engineering Department," or "Engineer's Department." The head of such boards or departments is generally designated superintendent, consulting engineer or city engineer. In only 12 cities were the sewers under a department apparently distinct from that regulating highways. In more than 100 of the cities the board of public works, or supervisory authority, had charge of all the sanitary or highway services carried on as municipal activities. The health department supervised or had supervisory control of refuse collection and disposal in 52 cities.

Mileage of Sewers.

The mileage of sewers classified by kind of system and construction material is shown for 157 of the 158 cities covered by the investigation. No report was obtained for Atlantic City, N. J., where the sewer system is owned by a private corporation.

The cities reporting had, exclusive of house and catch-basin connections, 25,011.2 miles of sewers, of which 18,361.5 miles were designed for conveying both domestic sewage and storm water, 5,258.3 miles for domestic sewage only, and 211.4 miles for storm water only. Between 1907 and 1909 there was a larger percentage of increase in the mileage of sanitary sewers, or those designed to convey domestic sewage only, than in the mileage of all sewers combined. This was due principally to the building of sanitary sewers in the cities of the Western States of light rainfall, when frequently no provision is made for carrying off storm water by means of closed sewers.

The total mileage of sewers is classified by construction material as follows:

Stone	129.9	miles
Brick	6,295.4	"
Brick and concrete	220.5	"
Brick and stone	96.2	"
Concrete	217.6	"
Reinforced concrete	101.1	"
Vitrified pipe	16,844.0	"
Cement pipe	865.3	"
All other	241.1	"

Of the total mileage of sewers, 11,013, or 44.0 per cent., were reported by the 16 cities of over 300,000 population. The following cities each had more than 1,000 miles of sewers:

New York	1,907.9	miles
Chicago	1,837.0	"
Philadelphia	1,185.1	"

The report shows other facts besides mileage, as well as the total maintenance and operation expenses for 1909, and the expenses per 1,000 population served by the sewer system and per mile of sewer.

The average cost of sewer service per 1,000 population served, for all cities making complete reports, was $290.90. Individual cities show large variations from these figures. The highest costs were reported from Newton, Mass., $1,358.45; New Orleans, $1,214.63, and Sacramento, $965.71. The high cost in many cities is caused by the necessity of either pumping or purifying their sewage, or both.

The average cost of maintenance and operation of sewers per mile of sewer was $243.65. Cities with a high cost on this basis were Baltimore, $1,174.20; New York, $739.14; San Francisco, $716.16; Woonsocket, $651.19; Hoboken, $592.36; Providence, $575.74, and Sacramento, $520.72.

Flushing and Cleaning of Sewers and Catch Basins.

Detailed information is given of the flushing and cleaning of sewers and catch basins. Practically all cities employed more or less flushing in connection with the operation of their sewer systems. Nearly all flushed a portion of their system by means of hose attached to fire hydrants, but 65 made use of automatic flush tanks installed in their system, and 14 had one or more portable flush tanks. Many cities avoided practically all cleaning of sewers by means of continual flushing.

Nearly all cities did some cleaning of sewers, but only 77 reported the gross mileage cleaned. Some cities reported absolutely no cleaning of sewers. Many others reported that where stoppages occurred in the system these were dislodged by means of jointed rods and then the sections of the system where such stoppages had occurred were thoroughly flushed.

The cost of cleaning per mile of sewer, for those cities reporting the cost, varied from $2.25 for Salt Lake City to $406.56 for Chicago.

Volume of Sewage.

The volume of sewage reported for many cities was an estimate, but in some cities the estimate was based upon the sewage pumped or purified, or upon their weir measurements.

The average daily discharge of sewage per capita of the estimated population served by the system, for all cities making reports, was 164 gallons. Included in that amount is a large volume of storm or surface water, water from factories and water used in flushing the sewers.

Each of the three following cities reported a daily contribution by factories of more than 20,000,000 gallons: Cleveland, 21,000,000 gallons; Indianapolis, 37,500,000 gallons; Paterson, 22,000,000 gallons. Two-thirds of the total flow from Paterson was reported as being sewage from factories.

Exclusive of storm water and waste from factories and basing computations upon cities having accurate estimates of sewage, the conclusion is arrived at that for many cities the per capita daily discharge of domestic sewage is not much, if any, in excess of 75 gallons. This conclusion is of interest principally in comparison with similar figures for most English cities, for which the average daily flow of sewage is about 25 gallons per capita, and in London 34 gallons. In the construction of a new system of sewers for the city of Edinburgh, the combined estimate of sewage and rainfall was 42 gallons per head per day. From such comparison it is apparent that there is a much freer use of water for domestic purposes in cities of the United States than in those of Great Britain.

Only 33 of the 158 cities of over 30,000 population pumped sewage. Of these only 11 reported pumpage of more than 50 per cent. of the total sewage of the city.

Purification of Sewage.

Only 19 cities reported the purification of any portion of their sewage, and of these only 8 purified more than 20 per cent. of the total, as follows: Providence, 97.3 per cent.; Columbus, 100 per cent.; Worcester, 99.5 per cent.; Reading, 100 per cent.; Houston, 100 per cent.; Brockton, 100 per cent.; New Britain, 100 per cent.; and Woonsocket, 100 per cent.

Other cities reporting the purification of any portion of

the total were: New York, St. Paul, Portland, Ore.; Omaha, Des Moines, Akron, Altoona, Pawtucket, Canton, Little Rock, and Auburn, N. Y. In most of these cities the sewage purified came only from a small section of the city. Two cities, Providence and Worcester, relied principally upon chemical precipitation for the purification. Columbus relied upon settling and septic tanks and sprinkling filters. The other five cities relied almost entirely upon sand filter beds. Some of these cities used settling or septic tanks for a partial purification of the sewage before it flowed onto the sand filter beds. Of the 19 cities, 4 reported the use of 48 chemical precipitation tanks; 6 the use of 16 septic tanks and 5 the use of 14 settling tanks. Of the same number of cities, 10 reported the use of 222 sand filter beds; 2 cities, Columbus, O., and Reading, Pa., the use of 6 sprinkling filter beds, and Auburn, N. Y., the use of 4 contact beds.

The cost per million gallons of sewage treated on the sand filter beds varied from $1.71, for Altoona, Pa., to $119.74, for Pawtucket, R. I.

The per cent. of suspended solids removed by means of passing the sewage through the sand filter beds varied from 60 per cent., for New Britain, Conn., to 100 per cent., for Worcester, Mass. The percentage of suspended solids removed reported for other cities is as follows: New York, 85; Brockton, 80; Pawtucket, 85, and Woonsocket, 88. These percentages are much larger than those reported for Columbus, O. (18), and Reading, Pa. (50), by means of sprinkling filter beds.

Several other cities than the 19 here reported are planning for the purification of all of their sewage within the near future. Among these are Waterbury, Conn., and Baltimore, Md., whose systems will be in operation within a short time. Auburn, N. Y., expects soon also to be purifying all its sewage.

SEWER MAINTENANCE IN NEW ORLEANS

ACCORDING to the latest published report of the New Orleans Sewerage and Water Board, a general foreman, two foremen, two laborers and two double teams attended to the maintenance of 352 miles of sewers. The pipes were cleaned by use of brushes and balls forced through by flushing water. The larger sewers were cleaned by hand, and those over 18 inches in diameter were inspected by workmen passing through them. Flushtanks and flushing manholes, 1,626 in number, were operated by hand every 30 days. A one inch connection from the water main permits rapid filling of the tank, when the automatic appliance discharges it. At the time of the report practically none of these appliances had been started in daily automatic service, but this can be done at any time.

CHATTANOOGA SEWAGE PUMPING STATION

Pump Well Forty-seven Feet Deep—Motors Sixty Feet Above Pumps—Alternating Current Motors Automatically Controlled—Handling Large Suspended Matters in the Sewage

By RCBERT HOOKE, City Engineer.

THE MUNICIPAL JOURNAL AND ENGINEER, of May 3, 1911, contained a description, with illustrations, of the intercepting sewer and sewage pumping station at Chattanooga, Tenn., but the pumping station, at that time, was only in course of erection. It was completed and put in operation the early part of last October and has been in service since that time, except when interrupted by floods in Chattanooga Creek or in the Tennessee River, during certain stages of which it was not designed to be operated.

The pumping station is constructed of plain and reinforced concrete. The pump-well is circular in form, 36 feet interior diameter at the bottom, and by means of reinforced concrete division walls 11 feet in height is divided into four separate chambers, consisting of a receiving chamber and three pump chambers. The sewage first enters the receiving chamber, from which it is diverted, at will, into either of the pump chambers by means of 20-inch Coffin sewer shear gates, operated by hand.

The bottom of the pump-well has an elevation of —4.0, referred to the city datum plane, which latter is the level of the zero of the United States river gauge at the Walnut street bridge. The circular wall rises to an elevation of 43 feet at the roof, 47 feet above the bottom of the well. Surmounting the roof of the pump-well is the motor room, the floor of which has an elevation of 56.37 feet, which is above the level of the floods of 1875 and 1886, but 1.3 feet below that of 1867.

The pump-well is entered by means of a concrete stairway, anchored to the circular concrete wall, which stairway is reached from a door at the north side of the pump-well, the top of the stairway having an elevation of 30 feet, and the landing at the bottom an elevation of 7 feet. The motor room is reached by means of a reinforced concrete spiral stairway, erected on the roof of the pump-well. The object in placing the motors at such an elevation was to have them above the level of the greatest known floods on the Tennessee River, excepting the flood of 1867.

The motor room is carried by a steel frame, encased in concrete, the walls and roof being of reinforced concrete. On the north side of the building is a steel ladder, reaching down to the landing of the inside stairway, by which access may be had to the pump-well from the roof of the latter.

The pumping station is at present equipped with two 12-inch centrifugal pumps, each of which is operated by a 75-horsepower electric motor, direct connected to the pump shaft, which is vertical. The pumps are of the submerged type, with enclosed impellers. The motors are started and stopped automatically. The pumps and shafting were furnished by R. D. Wood & Co., of Philadelphia, and the electric motors and automatic starting devices by the General Electric Co. Each pump has a discharging capacity of about 10 cubic feet per second, against a mean actual head

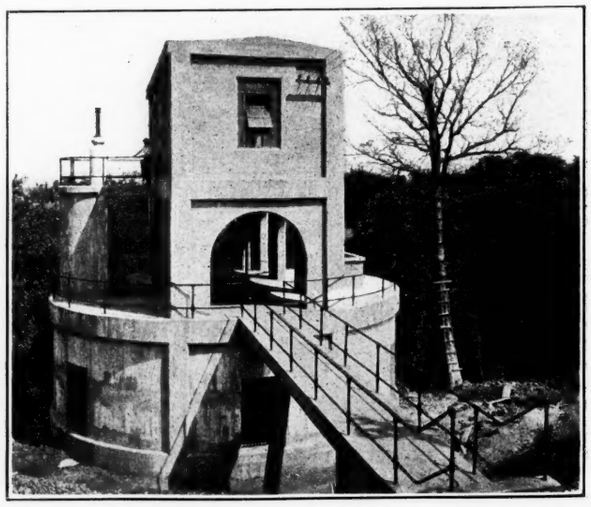


FIG. 1.—VIEW OF PUMPING STATION, LOOKING NORTH.

of 26.25 feet. They are operated at about 720 revolutions per minute. The discharge pipes are enlarged at the pumps from 12 to 14 inches, by means of a standard 12 x 14-inch increaser.

Alternating current motors 3-phase, 60 cycle, are used, and the current is delivered at a voltage of 2200. The electric current for operating the motors is furnished by the Chattanooga Railway & Light Co., and was formerly generated by a steam plant located in the city. It now comes from a hydro-electric plant located on the Ocoee River, 46 miles east of Chattanooga.

At present two sewers, a 20 and 24-inch, enter the receiving chamber of the pump-well, and provision is made for an additional 20-inch sewer. The 24-inch sewer comes from a 50 x 75-inch egg-shaped combined sewer, and is intended to deliver at the pumping station the dry weather flow of this large sewer. For the present the 20-inch sewer will also convey rainfall to the limit of its capacity until it is automatically closed, the combined sewer then discharging the entire contents into the creek. The 24-inch is a main sewer of the separate system, but at present receives a considerable volume of roof water. The two sewers, during dry weather, have an aggregate maximum discharge of about 2.5 cubic feet per second, but during rains the discharge is increased to 18 cubic feet per second. During dry weather a single pump is operated at a time, the pump chamber filling to a depth of 5.5 feet, when the pump is automatically started. When the sewage is pumped down to the floor level of the pump chamber, the pump is automatically stopped. The time required to fill the pump chamber and receiving chamber to 5.5 feet depth is about 15 to 16 minutes, when the sewage is at a maximum, and the time required to empty the two chambers is about 4 to 5 minutes. When a rain is falling and the discharge into the pump-well is in excess of the capacity of the single pump which may be operating, the depth of the sewage in the pump chamber increases until its level rises above the inlet of an 18-inch pipe which connects the two pump chambers. This causes the second chamber to fill and the second pump to be automatically started. The two pumps will then continue to work until the volume of rainfall and sewage reduces to the capacity of a single pump, when the second pump will be automatically stopped. It requires 37 kilowatts, or about 50-horsepower, to operate a pump under normal conditions. Motors of 75-horsepower were adopted to prevent the possibility of over load when working for long periods under greatly reduced heads.

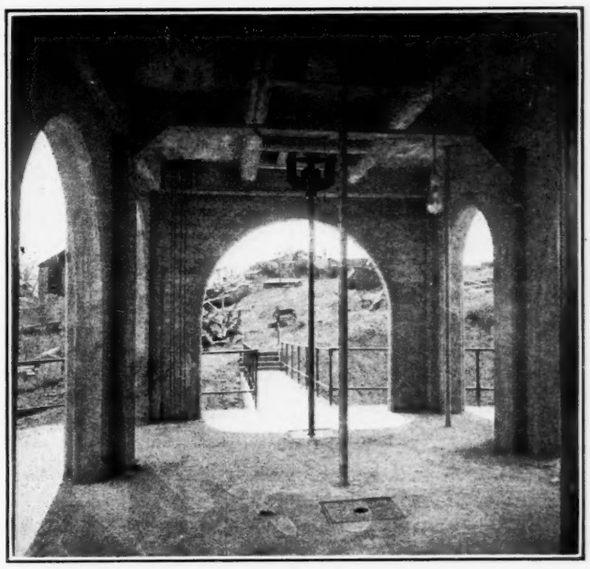


FIG. 4.—VIEW FROM ROOF OF PUMP WELL, SHOWING BALL THRUST BEARING OF PUMP NO. 2.

Much heavy matter is brought to the pump-well from the large combined sewer during heavy rains. This, or the greater portion of it, is retained in the receiving chamber

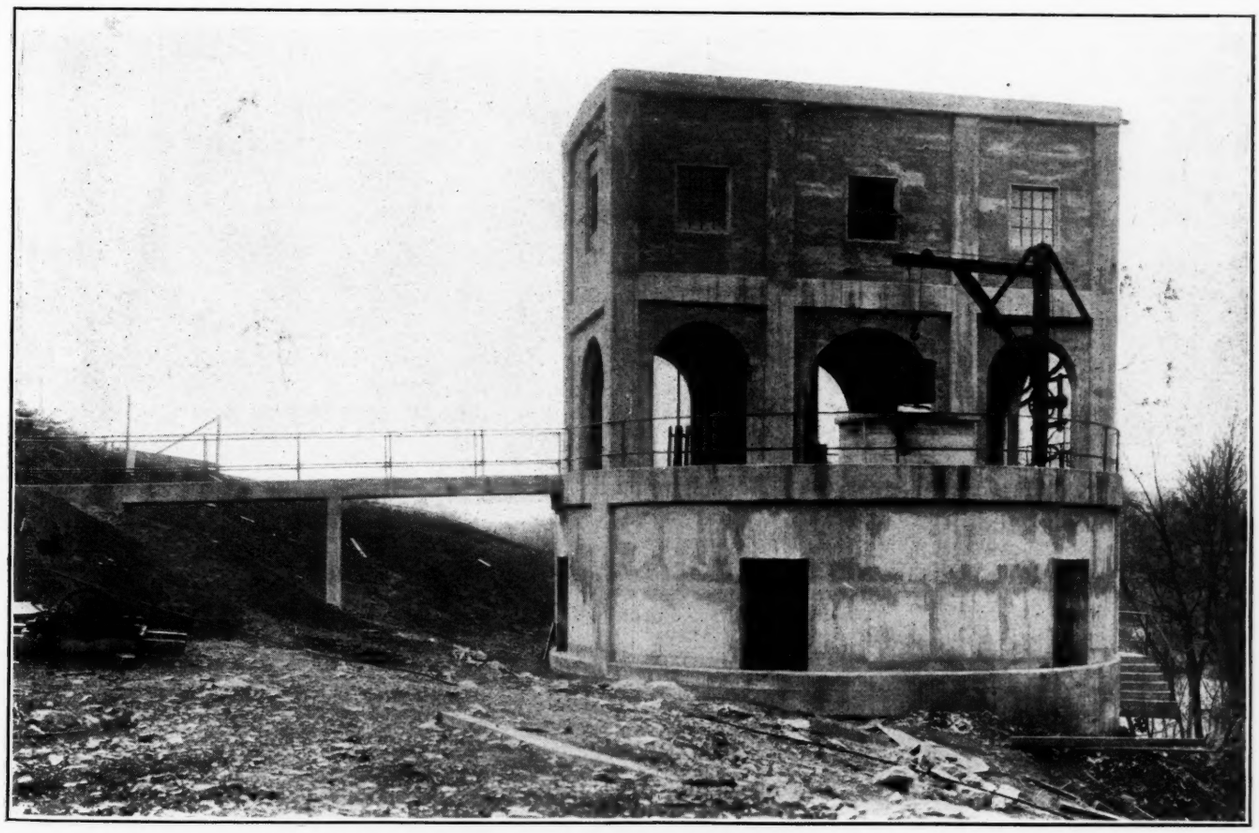


FIG. 2. VIEW LOOKING WEST, SHOWING DERRICK.

and is afterwards removed by means of an iron trip bucket which is hoisted through an opening in the roof of the pump-well by a derrick provided for this purpose, and dumped onto the ground, where it can be reached and removed to another dump. Cast iron screens of 1¾-inch square meshes are provided in the receiving chamber, but the screens do not prevent the passage of rags into the pump chambers, and more or less trouble has been experienced owing to the failure of the rags to pass through the pump. They ball up in the suction opening of the pump and have to be removed at varying intervals, in order to prevent excessive vibration of the pump shaft and a reduction of the pump's capacity. The presence of rags, or other obstructions, in the pump, is indicated by the vibration of the lower section of the pump shaft. The pump thus affected is then stopped and the other pump put in operation until the obstructions are removed. The sand, gravel and other heavy matter passing the 1¾-inch mesh screens of the receiving chamber are readily handled by the pumps. A cast iron cylindrical strainer, 24 inches in diameter and 6 inches depth, with 1¼-inch round holes or perforations, was attached to the suction pipe of one of the pumps as an experiment, but as the holes in the strainer soon became clogged it was discarded. The conclusion was therefore reached that screening had probably reached its limit in the receiving chamber. The writer has regretted that he did not adopt the open impeller type for one of the pumps in order to test, under precisely the same conditions, the comparative merits of the two types of pumps for sewage pumping. It is to be hoped that the centrifugal pump recently invented by Sir R. C. Parsons, for pumping unscreened sewage, will prove in practice all that is claimed for it by its inventor.

In designing this pumping station provision was made for the installation of a third pump at some future time. This pump will be erected in the middle chamber, at present unoccupied. This middle chamber is connected, by means of shear gates, with the other two chambers and with the receiving chamber.

The sewage pumping station is located on the south bank of Chattanooga creek and is just within the corporate limits of the city, being at present surrounded by cultivated fields. The conditions contiguous to the sta-

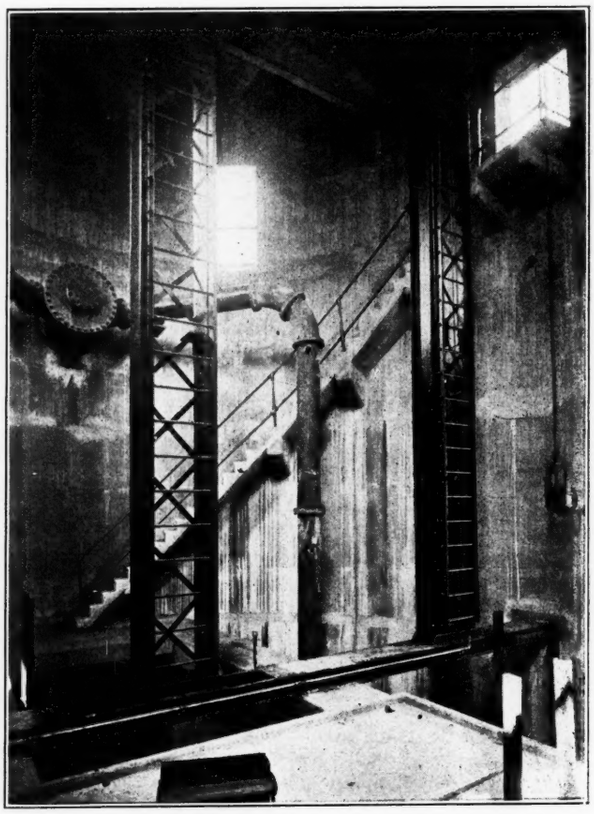


FIG. 5.—INTERIOR OF PUMP WELL, SHOWING DISCHARGE PIPES AND STAIRWAY.

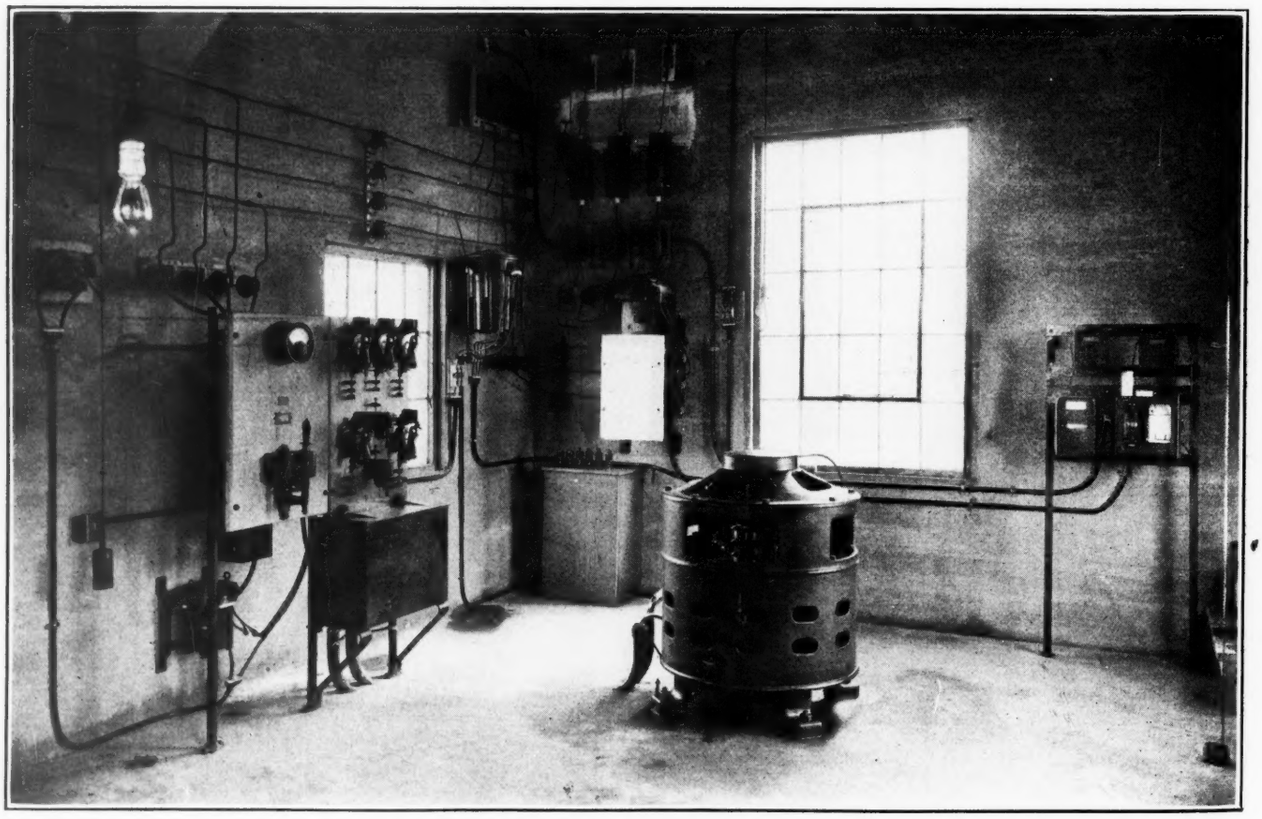


FIG. 3. VIEW OF MOTOR ROOM, SHOWING MOTOR NO. 2.

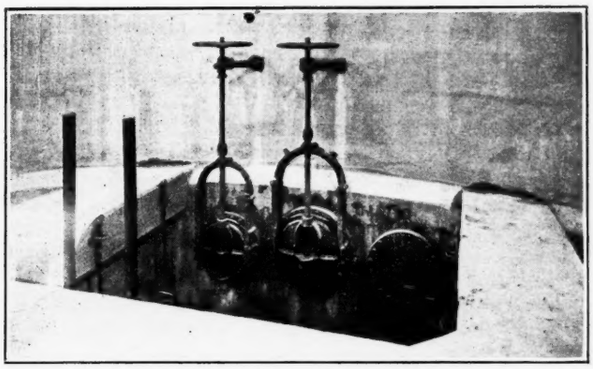


FIG. 6.—SEWER INLETS AND RECEIVING CHAMBER.

tion, aside from the station itself, are such as to make the locality undesirable as a residential district. The station site covers two acres and contains a knoll which is above the highest known flood. On this knoll is located the residence of the attendant in charge, who devotes his whole time to the care and operation of the station. The attendant is furnished with such help as he may require, from time to time, in removing accumulations from the receiving chamber of the station.

The station has cost, equipped, about $27,000, not including the grounds and residence of the attendant, which have cost in the aggregate about $6,000. The sewage pumping station and system of intercepting sewers were designed by the present city engineer.

GASES IN SEWERS

WE have received a communication from W. J. Stevenson, of the Turbine Sewer Machine Renovating Company, containing statements suggested by the article in our issue of March 28 entitled "What is Sewer Gas?" He states that during many years' experience in repairing and cleaning sewers for the city of Kansas City he has learned that it is not difficult to distinguish the odor of illuminating gas or gasoline from that of ordinary sewer gas, and that there is a great deal of the latter to be found in sewers. In entering sewers to make examinations he always goes first without a lantern in order to make sure, by sampling the odor, that there is no gasoline or illuminating gas. Where there is any considerable quantity of gas in the sewer he sets fire to this, after first coming out of the sewer and removing all the manhole covers for some distance each way. There is frequently more or less of an explosion, but the raising of the manhole covers prevents any damage resulting to the sewers. Following the explosion fresh water is flushed through the sewers from the nearest fire hydrant, and this carries away the fumes in a few minutes, leaving the air sufficiently clear for the men to enter.

Mr. Stevenson believes that much of the "sewer gas" results from the decomposition of organic matters which have accumulated in the sewer, and that this gas not only accumulates in manholes and finds its way through these and catch basin openings into the street, but that it also permeates the soil in the vicinity of imperfect sewer joints, and in this way may be responsible for some of the ill-health of residents in the vicinity.

CHEMICAL DISINFECTION OF SEWAGE

Large Scale Experiments on Use of Hypochlorites—Municipal Plants Now in Use—Results in Detail at Rocky Mount, N. C.—Description of a New Jersey Plant—Advantages and Disadvantages

By EARLE B. PHELPS, Consulting Sanitary Engineer, N.Y.

PREVIOUS to about 1905 chemical disinfection of sewage was recognized as a laboratory possibility and even its practical application as an emergency measure had been demonstrated; but it was the concensus of opinion among engineers that the process had not yet been developed to a point that would justify them in recommending it as a regular part of disposal works, to be operated day in and day out throughout the year. In several instances the matter was investigated and reported upon, and in each case the processes of chemical disinfection were invariably found to be prohibitively expensive. The disinfectant which had been most widely studied abroad was calcium hypochlorite. In this country, in consequence of the active interest which had been aroused by proposals to use copper sulphate in water supplies, especial attention had been given to the possibilities of the use of that disinfectant. In the fall of 1906 the preliminary results of investigations which had been made during the year at the Massachusetts Institute of Technology were published.* These experiments were completed in 1908 and the full results were reported as a Water Supply Paper of the U. S. Geological Survey.† The details of this work have also been discussed by the present writer upon several occasions and have been quite fully described in this journal.§

These need not be further discussed at the present time except to state that it was found quite feasible and reasonably inexpensive to disinfect both crude sewage and the effluents of sewage filters by the use of hypochlorite of calcium if proper attention were paid to certain operating details of the process which were fully described. The amounts of available chlorine necessary were found to range from two to ten or more parts per million, depending wholly upon the character of the water under treatment. (One part of available chlorine per million is approximately equivalent to 25 lbs. of bleaching powder per million gallons.) Similarly the total costs of operation were estimated to run from less than one to five dollars per million gallons treated.

The experiments upon which these results were based were what might be termed large-scale laboratory experiments. In Boston, where the majority of the work was done, the routine disinfection of a trickling filter effluent was carried on for one year at a rate of 5,000 gallons per day. Experiments with crude sewage were made with 700 gallons at a time, the sewage being pumped directly from the main outfall sewer of the city of Boston. At Baltimore, during a period of six months, a similar line of investigation was carried out with a trickling filter effluent at about the same rate of flow. At Redbank, N. J., a quarter of a million gallons of septic sewage were treated daily during a period of three months.

It will be seen, therefore, that these experiments approached, at least, a practical scale of operation and give reasonable assurance that the results could be actually duplicated in practice upon any desired scale. Engineers of experience are properly cautious in making practical application of work of this character and, although the results above quoted have been quite widely copied in the engineering press and have even been incorporated in the standard reference works, it is notable that where dis-

*E. B. Phelps and W. T. Carpenter, *Tech. Quart.* XIX, 1906, pp.382-403.
†U. S. Geological Survey, W. S. & I. paper, 228, Washington, 1909.
§Municipal Journal and Engineer, May 1, 1907; Jan. 20, 1909; Dec. 22, 1909; Feb. 2, 1910.

infecting works have been considered, a considerable margin of safety has been allowed in the estimate of the probable amount of chemical required.

In view of these facts and of the further fact that the process itself is a new one and its merits comparatively unknown, it seems worth while at the present time to go once more into this question of cost and of applicability, making use of the further information which has now become available from plants that have been installed.

At the present time the writer has personal knowledge of eleven such plants, with each of which he has been connected in a consulting capacity. All but one of these were installed primarily as disinfecting plants and employ no other method of purification. The plant at Providence, R. I., makes use of the existing chemical precipitation tanks for the hypochlorite treatment. Unfortunately, as so often happens, the engineer responsible for the design of works has little further official connection with their operation—unless, perchance, they come to grief—and in most of these instances the analytical data relating to the operation are exceedingly meager. Most of these plants are located in New Jersey and are under constant observation of the State Board of Health of that State. At the Providence works, under the direction of Julius W. Bugbee, superintendent, complete analytical data are being kept and will doubtless be available for discussion in the near future. The writer recently had occasion to visit two Southern plants, upon the design of which he had earlier been consulted by Gilbert C. White, consulting engineer of Charlotte, N. C. These plants are located at Rocky Mount and at Tarboro, N. C., and their design and installation are due to Mr. White. The larger of these, the Rocky Mount plant, was made the subject of a thorough test extending over four days, the results of which are of especial interest, since they illustrate the feasibility of operating small plants of this character with but little supervision, and since they indicate costs fully as low as, if not lower, than those that were indicated by the experimental investigations alluded to.

Results at Rocky Mount, N. C.

Rocky Mount is situated upon the Tar River. Its sewage system comprises about seven miles of sewers, accommodating about 2,000 people. Weir measurements indicate an average daily flow of 275,000 gallons and a maximum flow at the rate of 400,000 gallons per day during a few hours each day. The Tar River has a drainage area above Rocky Mount of about 768 square miles and the nearest point at which it is used for public water supply is at Greenville, N. C., seventy miles below. The extreme low water flow of the river at Rocky Mount is estimated to be about 120 sec. ft., or seventy-eight million gallons per day. This gives ample dilution for the prevention of any possible nuisance, and the only question involved is that of the pollution of the river from a bacteriological standpoint.

Under existing conditions it is obvious that no real danger would follow the discharge of the untreated sewage at this point, but the intention of the North Carolina Board of Health is to prevent any possible danger, and that body required purification of some sort, both at Rocky Mount and at Tarboro, lower down on the same stream. This is a most commendable attitude in that it forestalls danger and establishes a precedent which in later years, with increasing populations, will become a most valuable asset to the State. One of the greatest difficulties encountered by health authorities in the more thickly populated parts of the country is due to the fact that the cities have been permitted to pollute the streams for so long a period that any attempt at improvement is looked upon as an unnecessary and unwarranted infringement of acquired rights. The per capita cost of works in the larger communities is not necessarily any higher, and is oftentimes less than in the smaller ones; yet those cities which in the past have had free and unrestricted access to the streams for purposes of sewage disposal naturally hold the financial burdens involved in the construction of artificial disposal works, even of the most economical type, to be quite disproportionate to the results obtained, and in many cases quite prohibitive. It is, therefore, most gratifying to sanitarians and to those interested in public health matters to note the progressive and determined policies of such health authorities as those of the States of New Jersey and Pennsylvania, and now of North Carolina, in these matters.

The Rocky Mount plant was designed for a population of about four or five thousand people and cost in the neighborhood of $6,000 complete. It comprises a screen, a detritus tank, two preliminary tanks, very properly termed by Mr. White "attrition tanks," and the disinfecting chamber proper, together with suitable apparatus for the preparation and proper admixture of the disinfectant. Hypochlorite is being added at the rate of twenty-five pounds per day, or approximately ninety pounds per million gallons. Since sewages differ in their per capita volume, references to cost of disinfection are best made on a basis of contributing population. For this purpose the unit of 10,000 population is most convenient, since under average conditions of water consumption such a population will provide a sewage flow of about one million gallons per day. On this basis the Rocky Mount works require 125 pounds of bleaching powder per 10,000 population. This bleaching powder purchased in small lots costs, delivered, one and a half cents per pound, making a cost of chemical about $1.90 per 10,000 population per day. The capacity of the works provide roughly for one hour in the attrition tank and one hour in the disinfecting tank at full development. At present the corresponding periods are double these figures. Tests of the final effluent showed the presence of free chlorine at all times, and if more constant supervision were possible, as would be the case in larger works, it would be quite feasible to use smaller amounts of disinfectant than are here provided. On plants of this size, however, it is necessary to economize in supervision even at the expense of disinfectant. The actual labor involved in the operation of this plant requires less than two hours per day of the attention of an unskilled laborer and the somewhat careful supervision of this man's work by the superintendent in charge. The average results of the four-day test, which has been referred to, were as follows:

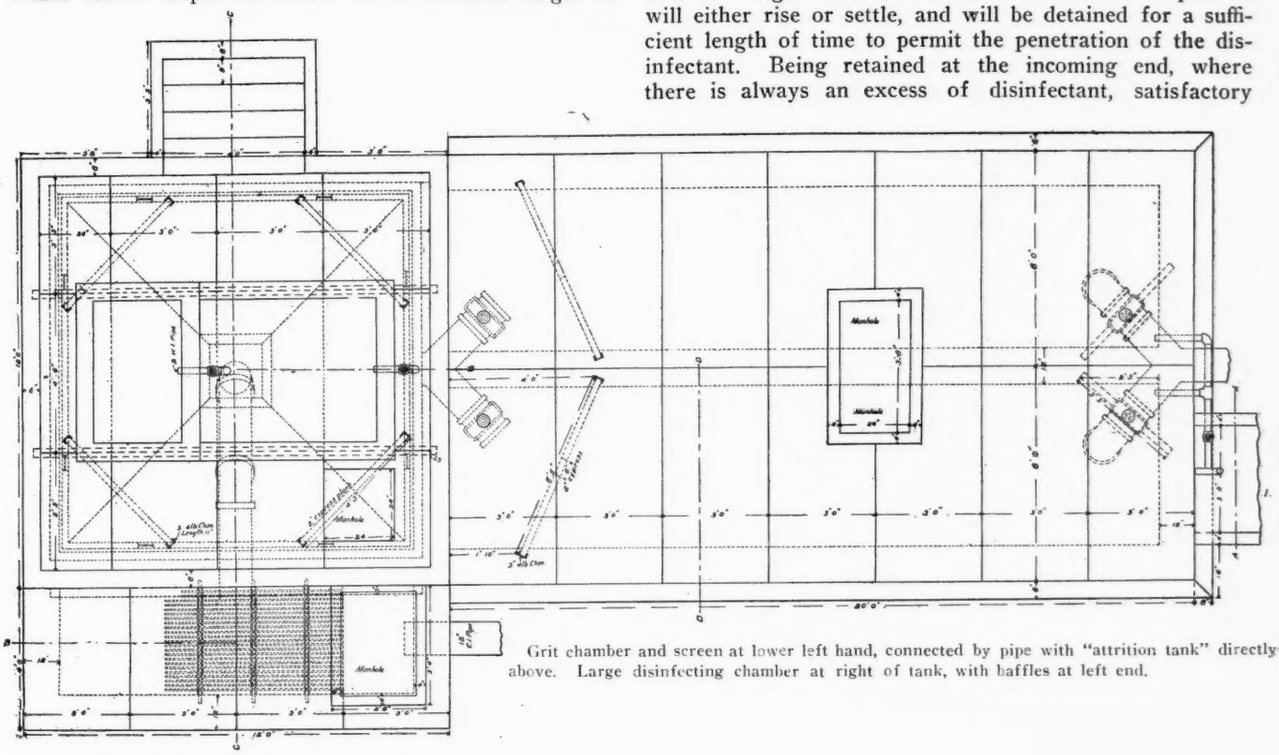
Bacteria growing at body temperature.. 99.7 % removal.
Bacteria growing at room temperature.. 96.9 % removal.
B. coli..... 96.1 % removal.

At a total cost per day, therefore, of something over $2 per 10,000 inhabitants, this plant is producing a result which could not be duplicated by any other type of purification works, with the possible single exception of a slow sand filter. The fact must not be overlooked that conditions here justify this mode of treatment. Nothing is done save by coarse screening to improve the physical and chemical characteristics of the sewage or to prevent such conditions as have made the Passaic, the Naugatuck, and many other streams that might readily be mentioned, so notorious. It is only under conditions similar to these where, by means of ample dilution combined with fairly rapid currents, a stream is fully capable of handling the volume of sewage in question, that chemical disinfection without further treatment is advantageous.

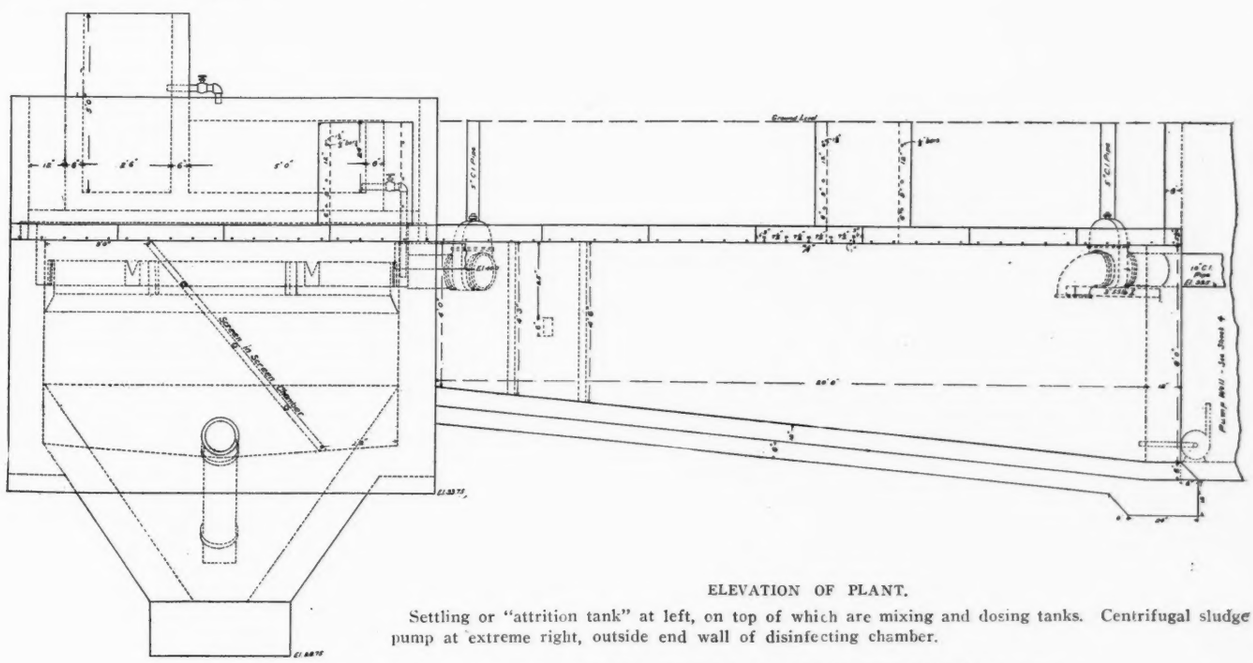
In the State of New Jersey works for the disinfection of sewage are installed at the State reformatory at Rahway, at Ventnor (two plants), Margate City (two plants), Ocean City and New Stone Harbor, all of which have been designed under the writer's care, either directly or through consultation with the local engineer. There are also plants at Atlantic City, Keyport and at Bridgeton. The New Jersey State Board of Health and its predecessor, the State Sewerage Commission, took an early interest in this process and were associated with the early experiments by which the practicability of chemical disinfection was dem-

onstrated. The simple enumeration of the above list of cities and towns, which are now relying upon chemical disinfection, is a sufficient indication of the Board's confidence in the process. In each case bacteriological purification is the primary consideration. Most of these communities are located upon the ocean front, where the protection of bathing beaches and of shellfish areas is essential.

Most of these plants are designed essentially like the one described at Rocky Mount. The illustration shows the details of the plant at the Rahway Reformatory, where the sewage of 500 persons is disinfected before discharge into the Rahway River. A rough screen is necessary in all cases, primarily for the protection of the waters into which the sewage discharges. It is further necessary to retain coarse suspended matter for a sufficient length of time to disintegrate it and permit penetration of the disinfectant. Disintegration is most readily accomplished by the "attrition tank," which was developed at the Massachusetts Institute Experiment Station some years ago, and is in reality a modified Dortmund tank. The sewage enters near the bottom in a downward direction and flows vertically upward to suitable overflows provided about the periphery. In larger tanks further additional overflows are provided by surface troughs. Such a tank, if suitably designed, will retain large size material and discharge the disintegrated products as fast as they are formed. The disinfectant is applied to the sewage as it leaves its trough. The disinfecting chamber itself is provided with a vertical baffle wall extending from top to bottom, with openings near the center line. In this chamber it has been found that the larger size solid material carried in suspension will either rise or settle, and will be detained for a sufficient length of time to permit the penetration of the disinfectant. Being retained at the incoming end, where there is always an excess of disinfectant, satisfactory



Grit chamber and screen at lower left hand, connected by pipe with "attrition tank" directly above. Large disinfecting chamber at right of tank, with baffles at left end.



ELEVATION OF PLANT.

Settling or "attrition tank" at left, on top of which are mixing and dosing tanks. Centrifugal sludge pump at extreme right, outside end wall of disinfecting chamber.

SEWAGE DISPOSAL PLANT FOR STATE REFORMATORY AT RAHWAY, N. J.

penetration of such material is assured. It escapes eventually, for the most part by becoming disintegrated and passing on through the middepth opening in the baffles.

The small amount of residual sludge and scum which may collect in this chamber may safely be removed from time to time, with the assurance that it is at least thoroughly disinfected. Possibly some better design may be worked out for accomplishing this same purpose, but a prime requisite in a plant disinfecting crude sewage is that the suspended matter must be retained in contact with the incoming supply of disinfectant for a longer time than is necessary for the sewage as a whole. During the subsequent passage of the sewage through the main body of the tank the disinfection is completed in the sewage itself and the disinfectant is entirely exhausted. Economical operation of such a plant is determined by always maintaining a residue of free chlorine in the sewage entering the last section of the disinfecting chamber and the absence of any such residue in the final effluent. It is only by a knowledge of the chemical and bacteriological principles involved in this treatment and by the adoption of the engineering design to meet the requirement of these principles that hypochlorite plants can be made to operate with proper efficiency and economy. Results are possible in almost any kind of tank if enough hypochlorite be added, but very careful design along the principles here laid down will result in an economy in disinfectant, the most expensive item of the process, which will more than pay for the additional first cost.

That the process of chemical disinfection is not to be restricted to use among smaller communities is indicated by the fact the Baltimore plans contemplate final treatment of the effluent with hypochlorite; that in connection with the new improved system of collecting and outfall sewers now being built at New Bedford, provision for thorough disinfection of all the sewage is being made, and that at Providence, where experimental disinfection has been carried on upon the entire flow of sewage for over a year, permanent works are now being installed.

Two objections to the process of chemical disinfection are commonly raised. It is frequently stated that crude sewage cannot be properly disinfected. The early German work has been corroborated recently by the valuable Philadelphia experiments, all of which tend to show that the larger the maximum size of suspended particles the greater the amount of disinfectant necessary. These experiments were made in ordinary tanks without any attempt at providing a longer period of treatment for the suspended matter than for the average volume. Such a result may be readily achieved by one of several methods, the essential feature of which is the longer detention of the suspended matter in the presence of fresh additions of disinfectant. Our experience in this respect, much of which is not yet in available form for publication, has amply justified the earlier results and has even indicated less amounts of chemical than formerly recommended. The second common objection is in connection with the treatment of sewage in combined systems. Here the enormous increase of flow during storms and the operation of storm overflows is involved.

Bacteriological purification of any kind is purely relative and in this process, as in all others, any desired degree of perfection may be obtained. It does not follow that, because the process as used in practise may permit the escape of two or three per cent. of the pathogenic bacteria, the treatment as a whole is unworthy of consideration. Neither does it follow that, because it is not feasible to purify more than 95 per cent. of the total volume of sewage discharged, the process should be discouraged. In properly designed sewerage systems a very small relative quantity of the total annual flow is permitted to escape by storm overflows and the efficient treatment of that portion which does arrive at the works will go far indeed towards improving sanitary conditions. As to the increased volume of sewage reaching the works at times of storm, it must be noted that it is character and not volume that determines the amount of disinfectant to be used. An increase in volume of 40 to 50 fold would decrease the efficiency of the operation, other conditions remaining constant, by about 50 per cent. By increasing the applied chemical from 5 to 10 fold during such periods, it would be quite possible to maintain the established standard of efficiency. In the former case, by reason of the comparatively infrequent occurrence of storms, no serious reduction in the average monthly result would follow. In the latter case high efficiency could be maintained throughout each day at costs which would not be at all incommensurate with the results to be obtained.

The chemical disinfection of sewage has been established on a sufficiently satisfactory basis of experiment and experience to justify a firm confidence that it is a process of permanent value, of entire feasibility, and under natural conditions which are quite commonly found, of greatest economy and benefit to the community.

SEWER FLUSHING

General Principles—Frequency of Flush—Methods Employed—Analyses of Costs by Different Methods—When Each is Most Economical

THE subject of sewer flushing is treated at considerable length, and from the engineer's and superintendent's point of view, in a pamphlet just issued by Merritt & Co., of Camden, N. J., in which there is a review of all the data and opinions of engineers which the author was able to find, together with some collected by him directly from recent municipal reports and from sewerage officials. These show that the actual tests of the effect of sewer flushing by measurements made in sewers themselves have been comparatively few. The general principles of flushing are first outlined, Folwell's "Sewerage" being quoted extensively in this connection. For actual experiments reference is made to Prof. Henry N. Ogden's paper before the American Society of Civil Engineers in 1898, J. H. Fuertes' and Rudolph Hering's discussions before the same same society, a series of diagrams published some years ago by Adams & Co., engineers, of London, and to a paper by W. J. E. Binnie before the Institute of Civil Engineers.

Concerning the volume of flushing water, the author summarizes these discussions as follows:

The condition and grade of the sewer, character of population, the water consumption, amount of infiltration and other local conditions make it difficult to set down a definite rule as to the volume of flushing water to be used for a sewer of given size. However, the following points will serve to summarize the data given in the previous pages:

(1) Except on steep grades, the flushing water discharged into the sewer runs full bore for only a comparatively short distance, practically the entire flushing effect being secured by the normal gravity flow of the combined sewage and flushing water.

(2) The greater the grade of the sewer, the less the volume of water to procure effective flushing of a given length of sewer.

(3) Ordinarily the volumes given in the table below may be adopted for sewers of from 4 to 15 inches in diameter.

Diameter of sewer, inches.....	4	6	8	10	12	15
Volume of flushing water, gallons	66	180	300	425	635	960

(4) The water consumption per flush may be adjusted in tanks of standard size by using one of the types of siphons in which the flushing level is adjustable and hence

the volume of water discharged is adjustable. The *total yearly water consumption* may be controlled by the frequency of the discharge of the tank, which should be accurately specified with automatic tanks, and with semi-automatic tanks depends entirely on the frequency of hand operation (as will be described later). With a tank of this type the water used per flush can be doubled or trebled, but the frequency of flushing reduced sufficiently to keep the yearly water consumption down to a minimum.

Concerning the frequency of flushing, he quotes Watson as saying, "The frequency with which sewers will require flushing will depend entirely upon the construction of the sewers, the amount of the normal flow, the nature of the sewage and the size of the flushing tanks. They will probably require to be flushed more frequently in summer than in winter, when rain water from off the roofs and houses may be of assistance in keeping them clean." (It is not considered good practice in this country to admit rain water to a house sewerage system.) "Sewers that are regularly flushed will not require anything approaching the quantity of water required by sewers which are not cleansed until they show signs of becoming foul or clogged." Both Folwell and Ogden state that flushing of some sort is required at the upper ends of laterals, most frequently where the number of houses using the sewer are least in number, and where the grade is flatest. George T. Hammond, in a report on sewering Wilmington, N. C., stated that "grades over one per cent. require only occasional flushing, which may be applied by hand; grades less than one per cent., but more than .6 per cent., will ordinarily require flushing every two days, while grades less than .6 per cent. will require flushing daily or oftener. I believe it is bad economy to be penurious in the use of flush water in a separate system. But the range of effect of a flush wave is naturally limited. * * * Where flushing from the tank is not effective, the resort must be had to hand flushing by hose."

The author of the pamphlet points out that engineers in considering the problem of sewer flushing have always assumed that wherever this was desired at intervals longer than a day or so, hand flushing alone was practicable, but that flushing might be needed only every few days. Under these conditions it would be wasteful of water to employ the ordinary automatic tank, which can with difficulty be adjusted to discharge at less frequent intervals than once a day; but what is known as a semi-automatic tank can be employed for this purpose. The operation of this tank is the same as that of the ordinary flush tank, with the addition of a contrivance by which the flow of water into the tank can be started by hand, after which the tank automatically fills, discharges and closes the valve admitting the water to the tank until it is again opened by hand. The object of this is to save the time of the laborer who discharges the tank, who, when the ordinary hand flushing contrivances are used, is required to remain at the tank until it is filled and then open the valve or stopper for admitting the water to the sewer.

The methods ordinarily employed for hand flushing are by filling a manhole or flush tank by means of a water cart, a hose connection from a fire hydrant, or a permanent connection with the water main, and then releasing the water to the sewer by opening a valve, removing a plug, etc. In automatic flush tanks the tank fills with water through a small connection with the water main, and is automatically discharged into the sewer when the tank is filled to a certain level. The difficulty experienced is in providing a continuous flow into the tank at the low rate required to fill it only once in 24 to 48 hours, and at the same time prevent the clogging of the outlet orifice of this pipe by dirt or rust, which the low velocity is not sufficient to prevent.

The subject of the cost of flushing the pamphlet referred to discusses as follows:

Three items go to make up the cost of sewer flushing:
(1) Cost of water.
(2) Cost of labor.
(3) Fixed charges against the apparatus.

Items 1 and 2 are independent of the frequency of flushing; that is, whether flushing is performed once a day or once a month, the cost per flush for water and for labor is practically the same. This is not true of item 3. The fixed charges on the apparatus include interest on the money invested and sinking fund. The charge per flush, therefore, is governed by the frequency with which flushing is performed, the interest on sewer bonds and local conditions.

Assume a case where water costs 3 cents per thousand gallons, and that the amount of flushing water required is 333 gallons, so that the cost per flush for water is one cent. This is an extremely low cost for water. This figure can be assumed here, however, as the same cost will be taken in each method of flushing. Where the apparatus used for flushing wastes water, as, for instance, where poorly operating automatic tanks discharge 2 or 3 (or more) times a day, where once every 2 or 3 days would be sufficient, the money value of the water wasted will add up to a large amount in a year.

FLUSHING WITH WATER CART.

Two men with a water cart can flush about 20 tanks per day and the cost for labor is as follows:

Two men at $2.00	$4.00
Two horses and cart	4.00
Total per day	$8.00
Labor per flush	40 cents
Water per flush	01 cent
Total cost per flush	41 cents

To this must be added the fixed charges against the apparatus used for flushing. As we are only making a comparative study, and a tank or manhole of masonry or concrete is required in all the methods considered, we can eliminate charges on that investment. The charges against the investment on water carts is included in the cost for horses and cart, which is considered as rental.

HOSE CONNECTION.

Using this method, the labor to handle about 20 tanks would be:

Two men at $2.00	$4.00
One horse, hose and cart	2.00
Total per day	$6.00
Total labor per flush	30 cents
Water per flush	01 cent
Total cost per flush	31 cents

FLUSHING MANHOLE.

The number of flushing manholes or tanks with hand flap valves that may be operated in a day depends largely on their distance from one another, on the time required to fill them and on the rapidity with which the attendant removes and replaces manhole covers, etc. A special report on the time taken to operate flushing manholes in a large city in the South is summarized by Table 1. As shown, one man flushed 44 tanks in one day.

TABLE 1.

Tank..	1	2	3	4	5	6	7	8	9	10
Time..	7.10	7.20	7.28	7.33	7.45	7.52	8.03	8.09	8.16	8.21
Tank..	11	12	13	14	15	16	17	18	19	20
Time..	8.31	8.39	8.46	8.52	9.06	9.15	9.25	9.35	9.40	9.45
Tank..	21	22	23	24	25	26	27	28	29	30
Time..	9.54	9.59	10.03	10.12	10.18	10.21	10.40	10.43	11.00	1.00
Tank..	31	32	33	34	35	36	37	38	39	40
Time..	1.15	1.25	1.32	1.39	1.55	2.10	2.35	2.45	3.01	3.15
Tank..	41	42	43	44						
Time..	3.30	3.45	4.00	4.20		Reports to office				

Assume as an average that one man with a horse and wagon can attend about 40 tanks daily. (In many cases a horse and wagon might not be used, the attendant walking

or riding a bicycle from tank to tank. However, as it will be assumed that a horse and wagon are also employed with the semi-automatic tank in the analysis following, it is consistent to set down that item here.) The cost per flush would then be made up of the following items:

One man	$2.00
One horse and wagon	2.00
Total labor per day	$4.00
Cost of labor per flush	10 cents
Cost for water	01 cent
Cost per flush exclusive of fixed charges	11 cents

To this must be added the fixed charges on the investment for the water connection and the lift valve. Assuming $15 as the first cost for the water connection and flap valve, the fixed charges at 10% = $1.50 per year. The fixed charge per flush depends upon the frequence of flushing. We will first consider a frequency of 365 flushes per year. The cost per flush for various frequences from one to 365 times per year is given by Table 3. For flushing 365 times a year the fixed charge is $\frac{\$1.50}{365} = .41$ cents, and the complete cost is as follows:

Labor per flush	10.00 cents
Water per flush	1.00 cents
Fixed charge	.41 cents
Total cost per flush (flushing 365 times per year)	11.41 cents

AUTOMATIC FLUSH TANKS.

With this method the cost of water per flush is as before—one cent. The cost for labor is zero. The fixed charges on the flushing siphon are dependent upon its first cost, the life of the apparatus and the value of money. The investment for a Merritt automatic siphon and Moise or Merritt regulator as installed would be about $30. Setting down yearly fixed charges at 10%, as before, we have the fixed charge per tank as $3, and for flushing 365 times per year, .82 cents per flush. The total cost per flush is then:

Labor	.00 cents
Water	1.00 cents
Fixed charges	.82 cents
	1.82 cents

The following table summarizes the cost of various methods of flushing at a frequency of 365 times a year:

TABLE 2—COST OF FLUSHING, IN CENTS PER FLUSH, AT A FREQUENCY OF 365 TIMES A YEAR.
(For flushing at other frequencies see Table 3.)

Method of flushing	Water cost per flush cents	Fixed charges* per flush, 365 flushes per year cents	Labor cost per flush cents	Total cost per flush cents
Water cart	1	0	40.0	41.0
Hose connection	1	0	30.0	31.0
Flushing manhole	1	.41	10.0	11.41
Automatic flush tank	1	.82	0	1.82

*For purpose of comparison fixed charges against the masonry tank or manhole can be neglected and with the flushing manhole and automatic tank, 10 per cent. of the cost of the apparatus is set down for interest, sinking fund and maintenance.

SEMI-AUTOMATIC FLUSH TANKS; FLUSHING AT VARIABLE FREQUENCY.

We have now to consider the cases where flushing is required less frequently, once or twice a week or less. Under these circumstances the semi-automatic tank is the most economical method of flushing. Furthermore, this type of tank can be used, when desired, as a full automatic tank, flushing at frequent periods or less frequently, the only labor required for flushing in this manner being the pulling of a chain from the outside of the manhole.

The cost for water is again one cent per flush. As to labor—a man with a horse and buggy, costing in all $4 per day, can pull the chain and set off 200 tanks, which would be only five times as many flushes as was assumed with the ordinary flushing manhole. This would make the cost for labor per flush 2 cents. The number of semi-automatic tanks that can be operated in a day by one man is dependent, as was the case with the flushing manhole, on the distance between tanks and the time consumed in operating the tank itself. With the Merritt semi-automatic tank the time required to pull up the chain is but a fraction of a minute, as contrasted to the time required to remove a manhole cover, turn on the water, wait till the tank fills, open the flap valve and discharge the tank and replace the cover, as is the case with flushing manholes.

To the cost of 2 cents per flush for labor must be added, as before, the fixed charges against the apparatus. The first cost of the semi-automatic tank over and above the first cost of masonry may be set down, as was the case with the automatic tank, at $30 at 10%, so that the fixed charge is $3 per year. The fixed charges *per flush* depend upon the number of times per year the tanks are operated. If set off only once, it will be $3, and adding in the cost of the labor and water, the total cost will be 303 cents. If it is set off 52 times a year, the fixed charges will be 5.77 cents, and adding water and labor, the total cost will be 8.77 cents.

In the first column of Table 3 is set down the number of times per year flushing is performed. Corresponding to these frequencies are set down the various costs per flush. The second column gives the cost with the semi-automatic tank; when flushing less frequently than 200 times a year

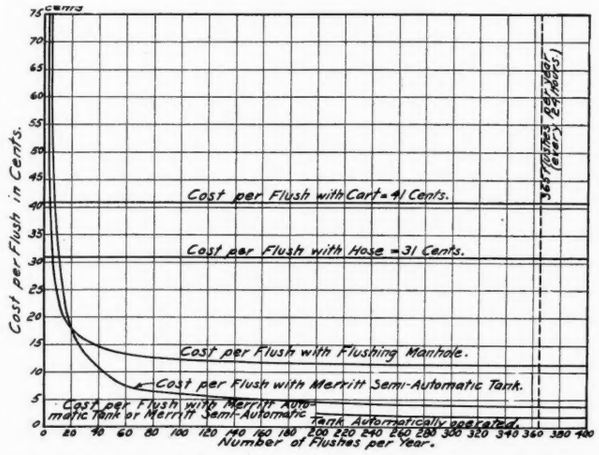

Cost per Flush in Cents.
Cost per Flush with Cart = 41 Cents.
Cost per Flush with Hose = 31 Cents.
Cost per Flush with Flushing Manhole.
Cost per Flush with Merritt Semi-Automatic Tank.
Cost per Flush with Merritt Automatic Tank or Merritt Semi-Automatic Tank Automatically operated.
Number of Flushes per Year.

Fig. 1.—Cost per flush at various frequencies per year, with different types of flushing apparatus. Above 200 flushes per year, the automatic tank or semi-automatic tank, automatically operated, is the most economical; at frequencies from 17-200 flushes per year, the semi-automatic tank is the most economical.

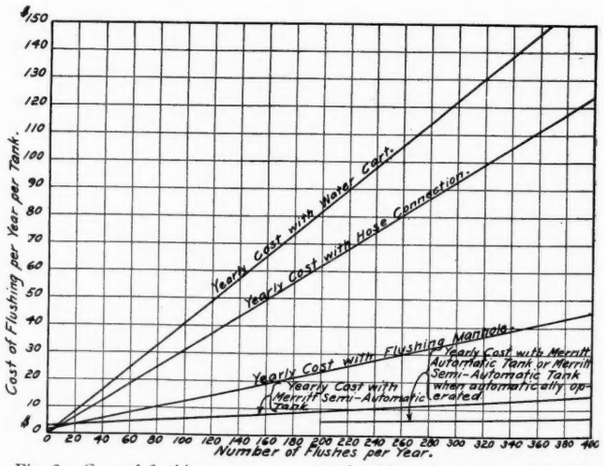

Cost of Flushing per Year per Tank.
Yearly Cost with Water Cart.
Yearly Cost with Hose Connection.
Yearly Cost with Flushing Manhole.
Yearly Cost with Merritt Automatic Tank or Merritt Semi-Automatic Tank when automatically operated.
Yearly Cost with Merritt Semi-Automatic Tank.
Number of Flushes per Year.

Fig. 2.—Cost of flushing per year per tank with various types of flushing apparatus and at various frequencies of flushing. For example, at a frequency of 100 flushes per year the total yearly cost with a semi-automatic tank is $6.00 contrasted to $12.50 with a flushing manhole, $31.00 with hose connection, etc.

the tank is hand operated, and at frequencies greater than 200 the tank is operated either automatically or by hand, the cost by both methods being given. The cost with flushing manhole and other methods is also given.

Or we may show the same data by the charts, which further illustrate the relative cost of the various methods of flushing. In Fig. 1 the cost *per flush* in cents is plotted against frequency, while in Fig. 2 the total *yearly* cost for flushing by various methods is plotted against frequency.

Under practically all conditions either the full automatic or the semi-automatic tank is the most economical means of sewer flushing. These figures, of course, are subject to market price of labor in any particular locality. They indicate, however, that where flushing is to be performed more than 15 to 20 times and less frequently than 200 times a year, the semi-automatic tank is the most economical apparatus to use. For flushing at intervals of every 48 or 24 houre or more frequently the full automatic tank is the most economical.

TABLE 3—COST OF FLUSHING IN CENTS PER FLUSH, WHEN FLUSHING AT FREQUENCIES FROM 1 TO 365 TIMES PER YEAR.

Number of flushes per year	Cost per flush with Semi-automatic tank hand-operated Cents	Automatic tank Cents	Cost per flush with flushing manhole Cents	Cost per flush with hose connections Cents	Cost per flush with cart Cents
1	303.00	....	261.0	31.0	41.0
25	15.00	....	17.0	31.0	41.0
50	9.00	....	14.0	31.0	41.0
100	6.00	....	12.5	31.0	41.0
150	5.00	....	12.00	31.0	41.0
200	4.50	2.50	11.75	31.0	41.0
250	4.20	2.20	11.60	31.0	41.0
300	4.00	2.00	11.50	31.0	41.0
365	3.82	1.82	11.41	31.0	41.0

CATCH BASINS FOR SEWER INLETS

Opinions of City Engineers as to Desirability of Using Them—Opinions Favorable and Otherwise—Details of Construction—Inlets With and Without Basins Used in the Same City

IN an endeavor to obtain the opinion of engineers and superintendents of sewerage concerning the desirability of using catch basins in connection with sewer inlets, we have requested a number of such officials in cities where some of the inlets have and others have not catch basins to inform us from their experience with both kinds of inlet what their opinions may be as to the advisability of using or not using such basins.

The superintendent of streets of North Adams, Mass., W. P. Buckley, states that he has had no experience with inlets without catch basins, except a few that are within 40 feet of the river, and "would not recommend, under any circumstances, the building of inlets without catch basins. They have no advantages, with the exception of the cost of building, and have all the disadvantages you can think of. Building inlets without catch basins would cause greater deposits in the sewers and it would be more difficult and more expensive to remove deposits from sewers than from catch basins. Inlets without catch basins are a source of much trouble in cold weather and during heavy showers, because in cold weather the snow gets into the outlet and freezes, and during showers the gravel and dirt get in and make the inlet useless."

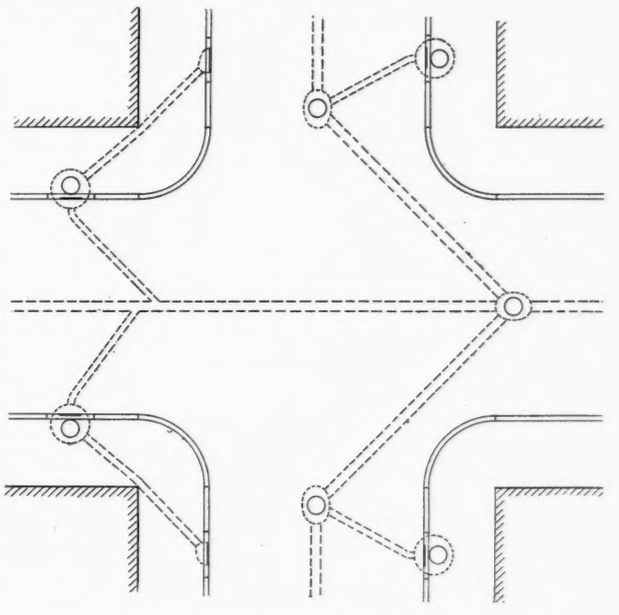
The superintendent of the Street Department of New Bedford, Mass., C. F. Lawton, states that they have in that city 1,208 sewer inlets with catch basins, while those without catch basins are comparatively few in number. "I certainly should not approve of admitting street water directly to the sewers without a settling basin, although, of course, the expense of cleaning out these basins is considerable; but any obstruction in our sewers caused by the direct entrance of street water would very quickly offset this expense."

In Providence, R. I., all inlets are connected with catch basins, except a very few quite ancient ones, and, with few exceptions, in the case of storm sewers, these catch basins are trapped. Where the basins are not trapped, some trouble has been experienced where hot water from boilers has caused steam to escape through their inlets. There are a number of inlets at street intersections which have no catch basins under them, but these extra inlets or "chutes" are connected with basins which intercept the silt before the water is discharged into the sewer. The accompanying sketch shows a typical example of chutes and basins at a street intersection.

Mr. Walter F. Slade, Commissioner of Public Works, to whom we are indebted for this information and the illustrations, sends us the following opinion of the desirability of using catch basins:

"We are of necessity of the same opinion as the engineers and officials in the majority of the cities, that it is not desirable to connect directly with the sewers. This is especially true in this city, because we are required to keep pollution out of our rivers for sanitary reasons, and to protect the shell fisheries; the city of Providence being at the head of the navigable waters of Narragansett Bay, and some of these oyster beds being within the city limits. Unquestionably, if the inlets were connected direct with the sewer, there would be a much larger deposit in the river, and while the expense might be less for removing it from the river, it is questionable in this city how much less it would be, as much of it would be deposited under numerous bridges that span the river.

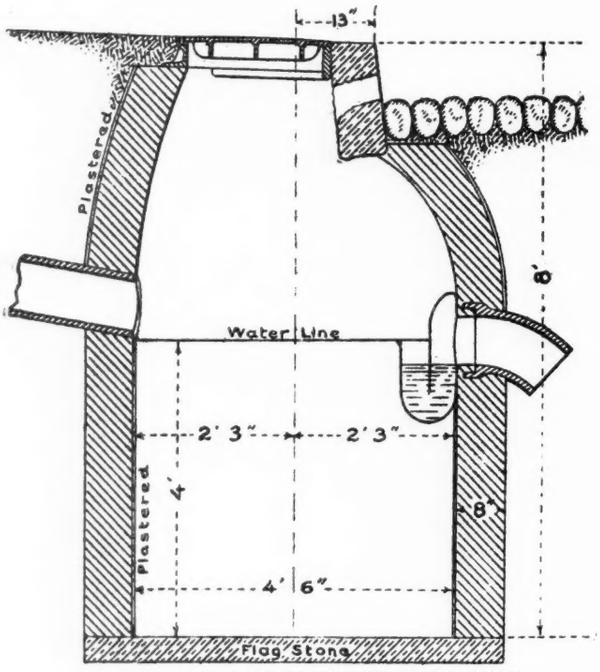
"In considering the necessities of this city, I would say that it is inadvisable to omit catch basins, for the reason that it would cause a larger amount of material to be deposited in the sewers, where it would cost more to remove it, and would defile the streams which it is necessary



SKETCH OF STREET INTERSECTION, SHOWING BASINS AND EXTRA INLETS; PROVIDENCE, R. I.

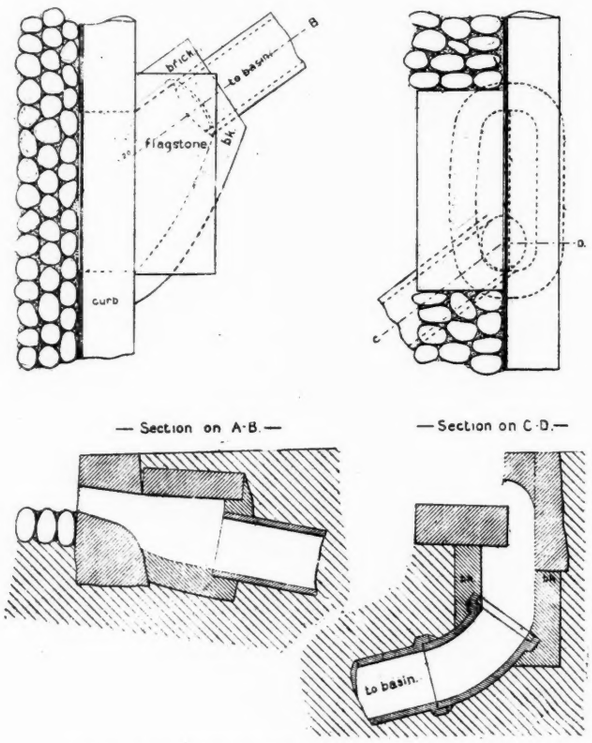
to keep as pure as possible, for the reasons above described."

The general construction of the catch basins and inlets used in Providence is shown in two of the accompanying sketches, while another shows the method employed in cleaning sewers by the use of a bucket. This type of bucket has been used in Providence for many years, as they have not been able to find any appliance which furnishes more practical and economical results. The sketch shows a bucket which is provided with six strips on the outside serving as runners and to prevent wear, the forward ends of which are continued beyond the top of the bucket with spike-like points which help to loosen up the deposit. The bucket is drawn forward by a rope passing around a snatch block at the bottom of a manhole, this rope being attached to a ring, to which in turn are attached three chains, which are fastened to the rim of the bucket. The bucket is drawn backward into the sewer by another rope and snatch block at another manhole, this rope being fastened to a ring in the bottom of the bucket.



SECTION OF REGULAR PROVIDENCE CATCH BASIN.

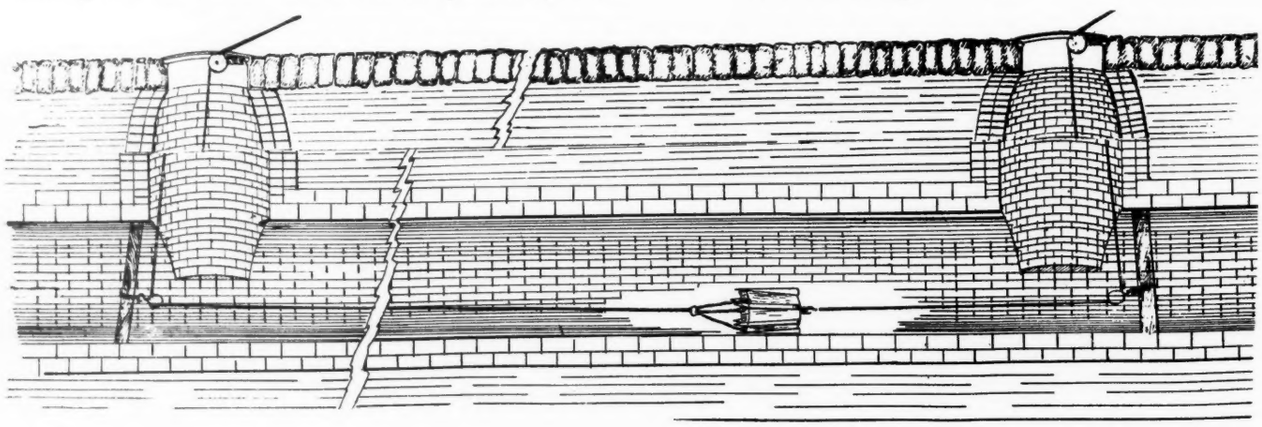
During the year 1911, 19,932.13 cubic yards of material were removed from the catch basins and sewers, at a cost of $1.16 per cubic yard. "While this price may seem excessive," says Mr. Slade, "it includes the cost of removing this material to the several dumps, which, of necessity, have to be away from the thickly settled part of the city, and further includes the cost of occasionally covering the material removed from the basins and sewers, where complaint has been made that the deposit is offensive. We have not separated the cost of cleaning the sewers from that for cleaning the basins. Although the cost of removing the material from the sewers is much



PLANS AND SECTIONS OF EXTRA INLETS, PROVIDENCE.

Cleanings of Catch Basins in Providence.

Month.	Number cleaned.	Average number of cu. yds. removed at each cleaning.
October, 1910	1,012	1.99
November, 1910	906	1.70
December, 1910	214	1.13
January, 1911	709	1.54
February, 1911	45	2.16
March, 1911	601	1.51
April, 1911	644	2.55
May, 1911	675	2.40
June, 1911	691	2.47
July, 1911	692	2.48
August, 1911	724	2.54
September, 1911	682	2.41
Total and average..	7,595	2.13



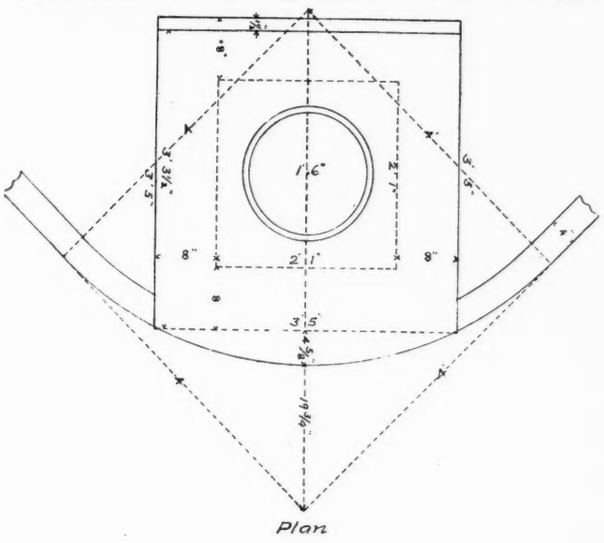
BUCKET FOR CLEANING SEWERS AND METHOD OF USE.

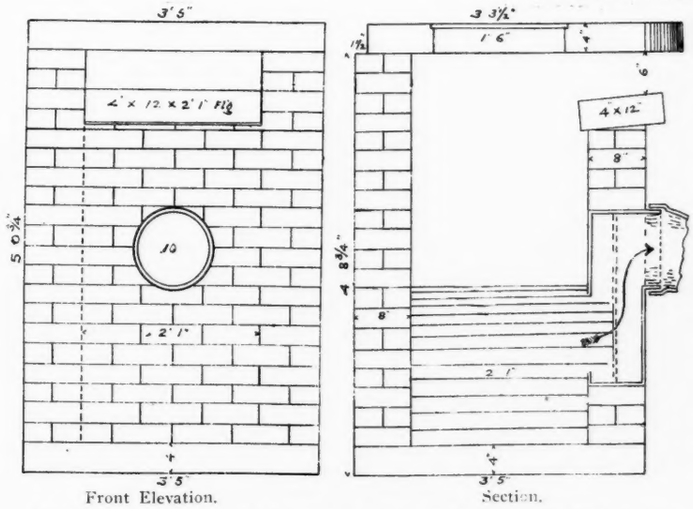
more than for cleaning the basins, the portion taken from the sewers is only 839.8 cubic yards out of 19,932.13 from both basins and sewers."

The average number of catch basins in use during the year ending September, 1911, was 5,232. The annual report of the Department of Public Works for that year shows that these were inspected once each month except during July and August, when they were inspected twice, and February, when they were not inspected at all. The number which were cleaned each month and the average amount removed from each are shown in the accompanying table.

This shows an average of 1.45 cleanings of each basin during the year; and an average amount removed at each cleaning of 2.13 cubic yards, the amounts varying from a minimum of 1.13 to a maximum of 2.55.

City Engineer John B. Otto, of Williamsport, Pa., writes that in that city it has been the practice for some time to construct inlets without catch basins, and up to the present time they have not experienced any greater amount of deposits in the sewers than would happen if catch basins were used. "We object to the catch basin as being unsanitary, emitting odors disagreeable to pedestrians, and requiring a great deal of labor to keep clean." When the inlets receive a large volume of water, a grating is placed across the opening to prevent the entrance of sticks and other obstacles which might clog the sewer. Even when it has been necessary to go deeper than the outlet pipe to place the bottom of the inlet below frost action, they have filled the lower portion with concrete up to the flow of the outlet pipe in order to prevent deposits in the inlet. They are not troubled with deposits in the streams at the outlets of the sewers, as the sewers empty into the west branch of the Susquehanna river, which is wide and has sufficient current to carry the suspended matter away. The accompanying illustration shows the kind of inlets used for combined sewers. Those used for storm sewers are similar, but have the bottom raised flush with the bottom of the outlet opening.



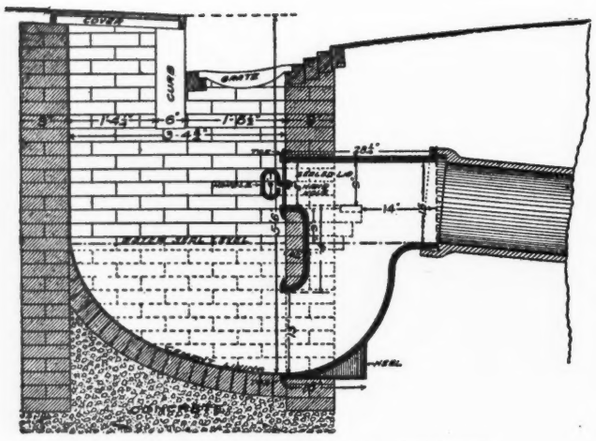


WILLIAMSPORT, PA., CATCH BASIN FOR COMBINED SEWERS ON UNPAVED STREETS.
Storm sewer inlets are practically the same, but with the bottom made flush with the bottom of the outlet pipe.

Alfred C. Gregory, engineer of sewers and water of Trenton, N. J., states that about 15 per cent. of their sewer system is on the combined system and the remaining 85 on the separate system. It has been the custom to place catch basins only where the water was led into the combined system, and to construct inlets without catch basins where the water entered the storm water drains. In many cases he has found the latter plan to work very satisfactorily; in fact, it is seldom that the drains themselves are stopped up or contain sufficient deposits to impede the flow of water. But a number of the storm water drains empty into canals or slowly flowing streams, and deposits are formed in these at the outlet ends of the sewers, in some cases sufficient to seriously impede the flow and in others causing complaints and opposition to the construction of further sewers on the part of the canal company. He believes, therefore, that it will be advisable to provide the inlets with catch basins where they are connected to sewers which do not empty into rapidly moving currents.

On the other hand, the catch basins constructed in connection with the combined system have been practically inoperative a large part of the time because of the fact that the department has not been allowed a sufficient appropriation to empty the basins. They therefore remain practically filled, and consequently do not retain any of the matters washed in from the street. In spite of this, there has been no trouble from stoppages in the combined sewers due to sand or street washings, but the sewers are kept quite clean and all matter washed in is carried to the outlet and discharged into the rapidly moving current of the Delaware. There has, however, been some difficulty with the stopping of the inlet pipes themselves, owing largely to the fact that in former years it seems to have been the custom to connect the inlets to the sewers by small pipes laid without any regard to grade and not necessarily in a straight line.

In Norristown, Pa., we are informed by Borough Engineer S. Cameron Corson, the old-fashioned deep catch basin was formerly used, but was found to be expensive to construct and keep clean and usually to be offensive. They soon filled up, and finally the filling covered the outlet and caused a flooding of the streets. During the past ten years Mr. Corson has been installing a different kind of inlet, remodeling many of the old-style catch basins by filling them up to the necessary level and putting in a new brick or concrete bottom and a trap, so as to make them conform to the new style shown by the accompanying illustration. In the present style of inlet the bottom of the mason work has the approximate form of a quarter of a sphere, the general curve of which is continued by the casting. At the top of the casting is a hand hole sealed with a tight cover, so that a trap is formed against the discharge of sewer gas through the inlet. The water entering from the gutter keeps the sand, leaves, etc., churned up and drawn down into the mouth of the trap by syphonic ac-



SECTION OF INLET AND TRAP AT NORRISTOWN.

tion caused by the outlet pipe from the trap being carried to the sewer with practically air tight joints. There is some precipitation of sand and grit in the bottom of the inlet, but this is so small that it is necessary to remove it only twice a year, except on unpaved streets, where half a cart load is sometimes found in them. There has never been any necessity of cleaning storm sewers on account of deposits in them. They empty into the Schuylkill river or large creeks, and Mr. Corson does not know of any serious deposits in these, there being ordinarily sufficient run-off from the water shed during storms to scour out any deposits which might be made by the sewer. As to the cost of cleaning the inlets, Mr. Corson states that the same men and carts will clean about twice as many of the shallow basin inlets as of the old catch basins in a given time. In cleaning, the cover to the handhole is first removed, a galvanized iron trough is placed through this extending into the sewer, and the water is bailed into this trough.

SEWAGE DISPOSAL IN SMALL CITIES

Operation of Disposal Plants in Thirty Cities of Less Than Ten Thousand Population—Work Required for Maintenance and Annual Cost—Some Plants Almost Entirely Neglected

We have endeavored to collect information concerning a considerable number of the small sewage disposal plants in the United States, with the idea of learning especially how much oversight is required by such plants and how much is given, and the cost of this in the several cases. Figures of both actual cost and approximate estimates of engineers are readily obtainable relative to the cost of constructing such plants, but the average city official finds it difficult to learn how much trouble and expense the plant is going to be after its completion. We also expected to find—as we did—that a number of the plants were receiving practically no attention and were consequently performing little, if any, of the service for which they were intended.

The questions asked concerning each plant were as follows:

1. What population contributes sewage to the plant?
2. What are the average, maximum and minimum rates of flow to the plant?
3. What kind of purification plant is used?
4. Describe in general the work required in maintaining and operating the plant.
5. Who is in responsible charge of it?
6. How many do actual work at the plant, and for how many hours per week?
7. What was the cost of maintenance during the fiscal year?

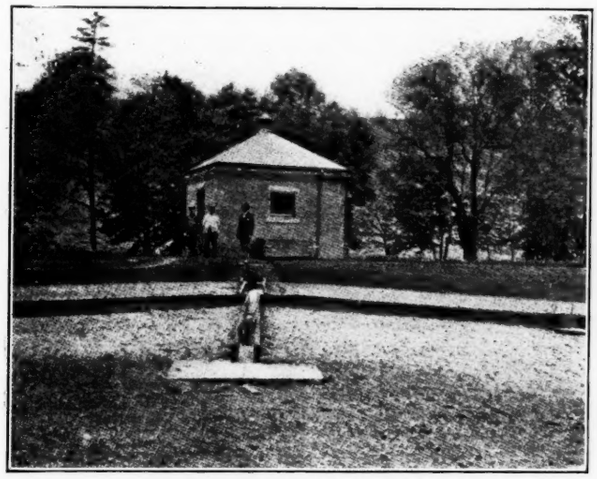
Because the answers to the various questions are so interrelated, and many of the replies were given in the form of a general letter, it does not seem best to endeavor to tabulate the answers, or to classify them in any way, except, possibly, according to a geological arrangement. The information returned by the engineers and superintendents addressed is given below.

In Concord, Mass., population about 2,000, the average amount of sewage treated during 1911 was 274,000 gallons a day, the maximum about 500,000 and the minimum about 190,000. Intermittent filtration is used, the plant comprising four filter beds with a combined net area of 3.3 acres; the beds being used in rotation. The sewage flows first into a storage reservoir with a capacity of 300,000 gallons, which is situated near the municipal power station, and from this is pumped daily onto one of the filter beds for from four successive days in summer to seven days in winter; after which the gates are changed and the next bed in rotation is used.

Maintaining and operating the plant requires attention to the pumps, which are located in the power station and are looked after by the regular employes of the power station; the cleaning of the screen chamber, which requires about eight hours' labor once in two weeks, and finally the removal of sludge from the beds in the spring, leveling the ridges with a harrow and smoothing up the beds with rakes and removing from the surface of the beds any dried sludge and weeds, as occasion requires through the summer. About the middle of November the beds are thoroughly cleaned and furrowed with diagonal and side distribution channels, which has resulted in more or less sludge becoming mixed with the upper portion of the sand during the twelve years the beds have been in use, so that now a considerable part of the maintenance work during June, July and August is in keeping the weeds down. This work is under the responsible charge of the superintendent of the Water and Sewer Department, the actual work being done by from one to six men, averaging about 54 hours per week for eight months of the year. The cost of maintenance of these beds during 1911 was $445, or about 22 cents per capita. The total cost of pumping the sewage was $1,363.90 and the total maintenance cost of the sewerage system, not including interest and sinking fund payments, was $3,351.16. For this information we are indebted to Leonard C. Robinson, superintendent.

Gardner, Mass., has a population of about 10,600 and a water consumption of 650,000 gallons per day, which amount is believed by Geo. N. Dyer, chairman of the Sewer Commission, to be practically that of the sewage also. The sewage is treated by passing it through four settling tanks and from these to sand filter beds. One settling tank is emptied of the accumulated sludge each month. The filter beds are cleaned three or four times a season, and late in the fall are hilled up as in the case of Concord. This work is under charge of the Sewer Commission, Geo. H. Howard being the foreman of the disposal plant. Two men are kept on the plant the year around, and in the summer from six to twelve additional men are used as the work requires. The cost of maintenance during the last fiscal year was $2,914.61, an average of 27½ cents per capita.

Lakewood, O., has a population contributing to the sewage of about 13,000. The average rate of flow during 1911 was 811,000 gallons, the maximum 1,045,000 and the minimum 595,000. (These figures are believed to be approximately correct.) The plant consists of septic tanks and



LAKEWOOD, O., CONTACT FILTER.
Building houses dosing apparatus.

contact filter beds, the operation of which is largely automatic and requires very little oversight. The plant is in charge of the director of public service, and one man devotes about 18 hours per week to looking after it. No record has been kept of the exact cost of maintenance.

Oberlin, O., has a permanent population of about 3,500, to which is added about 2,000 students during the college year. The normal flow is about 200,000 gallons, the minimum night flow about 25,000 gallons and the maximum flow due to storm water 1,500,000 gallons. During storms the plant is by-passed and storage reservoirs are used for settling the sewage. The treatment consists of a settling tank, with further treatment in a contact bed and on a sand filter. The work required in maintaining the plant comprises drawing off the sludge from the settling tank, cleaning the grips on the contact bed and raking the sand bed. The plant is in charge of the village engineer. The number of men working at the plant varies, but is believed to average about two hours per day. The cost of maintenance cannot be given, as the work is done by men regularly employed on other village work.

Westerville, O., has a population of about 1,500. No figures could be obtained of the average, maximum or minimum rate of flow to the plant, which consists of a filter bed of cinders. One man puts in about 25 hours a week in looking after the plant. The cost of maintenance could not be ascertained.

Bloomington, Ind., has a population of about 5,000. The amount of flow to the plant could not be given, but City Engineer U. S. Hanna states that it is carried by a 12-inch pressure line flowing under an average head of 18 inches, varying from 12 inches to 24 inches. The purification plant consists of a tank surrounded by contact beds, sprinkling filters and settling basins (see MUNICIPAL JOURNAL for 1909, page 776). During the three years of its operation scarcely any work has been required at the plant. The superintendent of sewers (who is also street commissioner) is in responsible charge of the plant, and visits it once a week. Two men put in from two to four hours per week at the plant; but for months at a time nothing is required except cleaning away the scum from the weir. The cost of maintenance could not be given, but is very small. Mr. Hanna reports the plant to be entirely successful. The filter beds will soon have to be raked over. No chemical tests have yet been made, but he is trying to arrange to have students of Indiana University carry on some tests this year.

At Highland Park, Ill., there are seven purification plants, each serving a separate sewer district. The population served is about 5,000. In four cases the plant consists merely of a settling tank, these treating the sewage from populations of 1,300, 1,100, 1,500 and 600 respectively. The costs of constructing these tanks were $3,000 for each of the first two, $3,500 for the third and $600 for the fourth. One plant, receiving the sewage from a population of 60, consists of a settling tank and filter and cost $500; another similar plant receives the sewage from a population of 390 and cost $10,500. The seventh plant receives the sewage from 50 and consists of an Imhoff tank costing $1,500. These are all inspected once a month, and the only maintenance required is cleaning the tanks. The commissioner of public works, J. C. Shields, is in responsible charge of the plant, which is working very well and has given no trouble except that the first mentioned settling tank blew up three years ago, following which some changes were made in its construction.

Concerning Jerseyville, Ill., City Engineer E. B. Shafer states that the sewage passes through a septic tank, from which it is discharged directly into large natural ditches. Nothing was spent for maintenance of this plant last year.

Paris, Ill., population 5,000, passes its sewage through a septic tank. City Engineer C. P. Lycan states that $30 a year is spent in the maintenance of it.

Wheaton, Ill., maintains a septic tank which receives the sewage from about 3,000 people. The amount of flow is not known, but A. L. Webster, county surveyor, states that it is carried through a sewer 15 inches in diameter, not more than 20 per cent of the area of which is occupied by the sewage. "When installed, this plant was recommended as requiring no attention, and for a period of five or six years was neglected. The effluent, however, became objectionable to parties below and adjacent to the tank, which was in the vicinity of the Chicago Golf Club and close to some of the summer residences of those who patronized the club, all of whom demanded that the condition be relieved. Since 1910 several attempts have been made to clean the tank and place it in better condition, and the open ditch outlet which had been in existence some twenty years was dredged for a distance of four miles in order to provide a better current. Last fall and winter the plant was given a thorough cleaning and is now probably in as good condition as when first installed. Somewhere in the neighborhood of $500 was expended in cleaning the tank." The plant is in charge of the committee on sewers and drains. As stated, nothing was spent in maintenance for several years. It is probable that the tank will either be removed to a distance from those who might object to it, or else will be remodeled and filter beds added.

Holland, Mich., with a population of 12,000 or more, several years ago built a septic tank and coke strainer for treating its sewage, but we are informed that the plant has been out of working order for a long time.

In Jackson, Mich., a septic tank receives sewage, neither the amount of which nor the population contributing to it could be given us by the city engineer. The tank is in responsible charge of the superintendent of public works, and its maintenance receives a part of the time of one man.

Fond du Lac, Wis., used septic tanks and filter beds some years ago, but they "have not been in use for a number of years on account of litigation."

Ripon, Wis., has a population of about 4,000, of which about 40 per cent. are using the sewer. The minimum flow is given as about 15,000 cubic inches per minute (93,500 gallons a day) and the maximum as 20,000 cubic inches per minute (125,242 gallons a day). Three filter beds are used, each of which receives the sewage for from ten to fifteen successive days, depending upon the temperature. In a screen house is a settling tank and a coarse screen. The maintenance consists of cleaning the beds and the screen, the former after each period of use and the latter from two to four times each 24 hours. The settling tank is flushed out twice each week, the sludge being carried to a small bed, from which it is raked up when dried.

In addition, sand is replaced which has been removed from the filters with the sludge, the grass along the borders of the beds is kept trimmed, and these and minor matters keep a caretaker busy most of the time. The plant is in charge of the Board of Public Works, and one man does all the actual labor at the plant, except for about 30 days in the early spring when the beds are being put into condition after the winter, during which season it is impossible to clean them. The chairman of the Board of Public Works, O. C. Stickle, to whom we are indebted for this information, states that the total cost of maintenance during 1911 was $450.48 in cash, to which should be added $6 per month for the rent of the house which the city owns. This gives a total maintenance cost of $522.48, or about 32½ cents per capita for the contributing population. "The plant is working fairly well, and with proper care will take care of our sewage for many more years."

The report of the Ohio State Board of Health for the year 1907 contains a number of figures of operation costs of plants in that State, from which the following figures have been tabulated:

Place.	Number tributary to plant.	Treatment.	Character of effluent.	Operating exp. Total.	Operating exp. Per person tributary.
Alliance	6,500	Chemical precipitation	Putrescible	$3,600	$0.55
Ashland	3,000	Septic tanks; sand filters	Good	393	.13
Canton	23,500	Chemical precipitation	Putrescible	3,200	.14
Clyde	1,050	Sludge boxes; sand filters	Good	120	.12
Delaware	4,000	Septic tanks; contact beds	Putrescible	.....	...
East Cleveland	7,000	Septic tanks; strainers; sand, coke and broken stone filters	Fair	6,277	.90
Fostoria	5,000	Sand filters; sand trenches and land treatment	Good	1,216	.24
Geneva	1,200	Septic tanks; sand filters	Good	700	.58
Glenville	6,500	Chemical precipitation; strainers; sand filters	Poor	3,858	.59
Kenton	400	Septic tanks; strainers; coke and stone filters	Fair	106	.26
Lakewood	7,000	Septic tanks; contact beds	Good	284	.04
London	500	Septic tanks; contact beds	Good	.....	...
Mansfield	12,000	Septic tanks; contact beds	Good	5,260	.44
Marion	8,000	Septic tanks; contact beds; sand and fine stone filters	Good	1,224	.15
Oberlin	3,400	Sludge pits; land treatment	Fair	700	.21
Plain City	725	Septic tanks; sludge pits; contact beds	Good	199	.27
Shelby	1,600	Reservoirs; cinder filters	Good	600	.37
Westerville	300	Septic tanks; contact beds; cinder filter	Fair	.....	...
Xenia	.....	Sludge pits; gravel filters	Putrescible	.....	...

INDIANA SEWAGE PURIFICATION PLANTS

Probably no section of the country contains a greater number of small sewage disposal plants than that south of the Great Lakes in which lie the States of Ohio, Indiana, Illinois, Michigan and Wisconsin. In Indiana, Illinois, and Wisconsin they are especially numerous. In 1910 Langdon Pearse, of the Chicago Sanitary District, compiled a list of the plants in those States, and found in Indiana 11 plants, all but two of which consisted wholly or partly of septic tanks. Four of these were private institutions, and in no case was the population over 9,000. In Illinois there were 45 plants, 5 of which were connected with private institutions; and only 4 of the municipalities had a population of over 10,000, the largest being Belleville, with a population of 21,122. All but 5 of the plants were described as containing septic tanks, and 4 of these 5 were said to contain "settling tanks" or "tanks." In Wisconsin 25 plants were found by Mr. Pearse, of which 9 were connected with private institutions; and only 3 of the municipalities had a population of over 10,000, the largest being Madison with 25,531. All but 5 were described as containing septic tanks either alone or combined with filters, and of these 5, one consisted of a settling tank and another of sedimentation tanks and filters.

Many of the Indiana plants have been described briefly by R. L. Sackett, professor of sanitary engineering in Purdue University in a paper before the Lake Michigan Water Commission. A plant was constructed for the Indiana Boys' School at Plainfield in 1902, consisting of a septic tank which receives the sewage from 750 persons and is described by the superintendent as being "adequate and satisfactory," although some complaint has been made of the condition of the stream which receives the effluent. About the same time four small sand filters (which have since been abandoned) were constructed at Indiana Harbor, in the Calumet district. In 1898 a chemical purification plant was built at the Southern Hospital, near Evansville, for treating the sewage from 800 to 900 people. This plant cost $18,000, and comprised lime and soda ash storage bins, mixing tanks, sludge pump, sludge press and electric motor. The effluent was filtered through sand. The cost of chemicals, attendance and sludge disposal was about $12,000 a year. In 1906 the chemical plant was abandoned and sedimentation and contact filters substituted for it, the rebuilding of the plant costing $11,000.

In 1902, at the Eastern Indiana Hospital for the insane, a plant designed for 1,000 people was provided in the form of 18 acres of irrigated land, this being the largest sewage irrigation area in Indiana. When not used for irrigation the sewage is clarified in a grit chamber and settling tank, followed by 6 slow sand filters having a total area of one acre.

In 1904, Bedford, a city of about 8,000 population, constructed a septic tank 76 by 24 feet, the effluent from which disappears into a sink hole.

In 1907 a septic tank and sand filters were constructed in West Richmond, the population of which is less than 1,000.

In 1908 Bloomington built an octagonal septic tank, the effluent from which flows to stone filters which, when full, discharge through independent siphons on to sprinkling filters. The primary and secondary stone filters are octagonal, concentric with the central tank, the whole making a very compact plant. In 1908 the city of Angola constructed a concrete tank and preliminary filters, the latter discharging intermittently on to six sand filters. The effluent from the last discharges into a ditch which carries very little diluting water, on which account a high degree of purification is demanded by the farmers below.

The Indiana girls' school at Clermont was at first provided with a patented septic tank 40 by 6 feet by 6 feet deep; but as the number of students increased the pollution of the creek became a nuisance and in 1909 a second tank was added, which is operated as a stone filter from which filter the effluent is discharged on to two percolating sand filters for final treatment. The cost of construction was $6,000. The number of students at present is about 400. No putrefaction is observed in the creek, although there is no other water flowing in it for long periods during dry weather.

In addition to these there are numerous small plants installed for high schools of 300 students or less, for county and city buildings, and for country and suburban groups of residences.

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CHANGE OF ADDRESS

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributions suitable for this paper, either in the form of special articles or of letters discussing municipal matters, are invited and paid for.

Subscribers desiring information concerning municipal matters are requested to call upon MUNICIPAL JOURNAL, which has unusual facilities for furnishing the same, and will do so gladly and without cost.

MAY 2, 1912.

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Maintaining Small Disposal Plants

LARGE sewage disposal plants are generally operated with a fair degree of intelligence and faithfulness, but a great many of the small plants are given only perfunctory attention by a street superintendent or other official of the town or village who has practically no knowledge of the principles of the plant and takes even less interest in it. In fact, there are undoubtedly some which are not even looked at for weeks or months at a time, and we have heard of one instance in which, following a change of administration, the new officials were entirely unaware of the existence of the sewage disposal plant. Some of the most serious typhoid epidemics of the country have been traced to sewage discharges from communities insignificant in size, and it should be the duty of someone to see that these plants are properly operated, a duty which, it appears to us, should lie with the local Board of Health, under the supervision of the State Board. As shown in the article on another page, the cost of properly maintaining the plant is not great, seldom exceeding 20 or 30 cents per capita per year for even the smallest communities.

Inlets With or Without Catch Basins

ON another page of this issue will be found the opinions of six engineers concerning the use of catch basins in connection with storm water inlets. Several more had been asked to give their opinions, but only these six responded; and it is probably entirely a matter of chance, and by no means to be taken as generally representative, that these replies are about equally divided for and against the use of catch basins. The experience of Trenton, N. J., is especially interesting, as it appears to show that the non-operation of the basins, even on combined sewers, does not cause any stoppages in the sewers themselves; but that the only objection to the omission of catch basins is the possibility of the formation of deposits of sand and other heavy street dirt at the outlets of the sewers. This, of course, may not be true under every condition of sewer grade and flow of the stream which receives the sewage; but where such deposits do result it is worth calculating whether it would not be cheaper to remove these deposits at the few outlets, say once a month, than to keep clean all the catch basins which it would be necessary to install to prevent such deposits, consideration also being had of the additional cost of a catch basin inlet as compared with a plain inlet.

The figures contained in the article describing the catch basins of Providence were all given us directly by Mr. Slade or were taken from the annual report. We must confess that in some respects they do not in our opinion confirm his ideas as to the desirability of catch basins. The standard basin now built by the city is 4 feet 6 inches in diameter and 4 feet deep below the water line, giving a capacity of 2.37 cubic yards below the edge of the trap. The average amount reported removed at each cleaning is so nearly equal to this that it would appear as though the basins were all practically full when cleaned; and our experience of the scour of water falling into a catch basin from a heavy storm leads us to believe that when this is the condition a considerable amount of matter which would otherwise be intercepted by the trap has been carried into the sewer, only the largest, heaviest particles being retained in the upper foot of the basin. Some doubt as to the accuracy of the estimates of quantity of dirt removed from the basins is occasioned by the fact that during each of last six months of the fiscal year the average amount removed from the basins at each cleaning exceeded the capacity of the standard basin, which would seem to be improbable. It is quite possible, however, that a number of the basins were larger than the present standard. With considerable allowance for this it still seems probable that few, if any, basins were cleaned until they contained as much dirt as it was possible to accumulate in them under ordinary conditions; it being our experience that the drop and swirl of the water entering from the street prevents the deposit of any material within the top 6 inches or so of a catch basin except stones or other heavy particles, unless of dirt carried in at the last end of a storm, which does not often happen.

In addition to the matter of amount of dirt removed at each cleaning, we have the figures showing that on the average each basin is cleaned once in a little more than eight months. As we have frequently stated, it does not appear to us that a basin which is cleaned as infrequently as this is of much value for intercepting material after the first four months, unless the amount of dirt washed in is so small that it is doubtful whether it is worth while to intercept it at all. In fact, an inspection of the data, together with the figures already referred to, leads us to believe that from one-half to four-fifths of the catch basins in Providence are unnecessary and are seldom, if ever, cleaned. We may be mistaken in this conclusion, but if so, and all the basins are cleaned more than once a year, it seems very doubtful whether any of them are retally necessary.

NEWS OF THE MUNICIPALITIES

Current Subjects of General Interest, Under Consideration by City Councils and Department Heads—Streets, Water Works, Lighting and Sanitary Matters—Fire and Police Items—Government and Finance

ROADS AND PAVEMENTS

Macadamize All Rosalia Roads

Rosalia, Wash.—The Rosalia Chamber of Commerce has taken up the work of macadamizing roads leading into Rosalia. The State road passing through here from north to south has been macadamized several miles south, but to the north the macadamizing extends just beyond the city limits. At the last meeting of the Chamber of Commerce a committee, consisting of F. J. Witner, E. E. Flood and M. Meuli was appointed to consult with farmers whose land adjoins this road and to secure their co-operation.

Jackson to Improve Many Streets

Jackson, Ky.—Street improvement has commenced in Jackson. All the macadam thoroughfares are being cleaned and repaired, while the grades are being established on other streets for grading, which is to begin at once. Fifteen thousand dollars will be spent in macadamizing new streets this summer under a bond issue that was voted at the November election. About seven miles of concrete pavement will be laid during the next few months at the expense of the property holders, who are also being required by the town to build gutters in connection with the walks.

City Adopts Suggestions

Chester, Pa.—Consulting Engineer A. F. Damon has made several recommendations to the street committee which have been adopted by councils. One of these is that an inspector of curb setting be appointed, something that the city has not had heretofore. Another recommendation is that the engineering department be instructed to prepare in advance of the work a drawing of each street, giving the block lengths, properties and owners' names; and also that a form of notice to property owners be adopted for the purpose of systematizing the records of the engineering department and further to reduce the number of complaints and claims at the time bills are rendered

City Engineer Plans to Start Work

Watertown, N. Y.—The 1912 work of the city engineering department will start about May 1. City Engineer E. W. Sayles is preparing his plans for the season and it is expected that the work will be well under way within the next few weeks. Macadam work has been started in Main street between Mill street and LeRay street. This is some of the most important of the North Side work to be done this year. The contractors have also started on the remainder of the Anthony street pavement between the station and Mill street. This work will be completed within a short time, it is expected. Despite the late spring, City Engineer Sayles does not expect the work will be held up any. Should the question of expending $30,000 for paving several of the city streets be put to a special election, as is now considered, it is probable that a large amount of work not yet planned will be undertaken early this summer.

Street Paving Commences

Harrisburg, Pa.—The first steps toward paving for the year 1912 have been taken. Highway Commissioner Fritchey has ordered the Central Construction Company to go ahead with the excavation, and grading of Hunter street from Crescent to Fifteenth, and Curtin from Fifth to Jefferson. The curbing was laid in these streets last fall and they will soon be ready for the asphalt. The highway commissioner announces that the Central and Barber companies have been given schedules to work out in their paving movements, and according to these, when the Central company finished with Hunter and Curtin they are to go ahead with the upper portion of Susquehanna street, Curtin, and then Peffer streets. The Barber company will soon start the paving of Bell alley and then take in Basin alley, Rhoades, Compass and Mt. Pleasant.

Tri-State Highway Planned

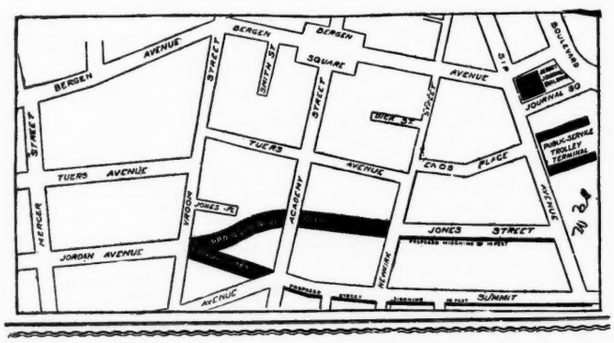
San Antonio, Tex.—The Bexar County Highway League is actively promoting the construction of a tri-State highway to run between this city and Denver, Col., a distance of about 800 miles, if a direct route is followed. The proposed road will cross a corner of New Mexico. Several sections of it have already been constructed. F. L. Bartlett, State highway commissioner of Colorado, has been arousing interest among the people along the route in Texas, and at his suggestion the local league will send out a committee to log the completed sections of the highway between this city and Sweetwater, Tex., about 200 miles.

Motor Trucks Will Help in Street Work

Pittsburgh, Pa.—That motor trucks for handling asphalt in the repairing of city streets would greatly facilitate the work, and that the public works department is anxious to get busy on this work as quickly as possible, was the declaration of Director Armstrong. This was in answer to a question of Councilman Garland, who wanted to know what assurance could be given property owners that the city's thoroughfares would be placed in condition this season. "While this is only April and the season is just starting," declared Director Armstrong, "we are preparing to rush the work as fast as possible. You must bear in mind that every man wants his own street repaired at once. Of course the main thoroughfares will be the first to receive attention. Some of the streets are being held back on account of contemplated track rebuilding by the traction company. This is causing some delay in the work now in progress on Liberty avenue. The department has enough money from the building of the asphalt plant," he continued in answer to a question as to whether council could help in any way by providing motor trucks or equipment, "for the purchase of three trucks. These are badly needed and would help a lot." Director Oursler, of the department of supplies, was forthwith called before the councilmen to explain. He said some delay had been caused by the investigation necessary to determine the best bids. The trucks are of special design, he said, and made under plans from the bureau of construction. The contract cannot be let until the mayor, who is out of the city ,returns.

New Streets Proposed by City Plan Commission

Jersey City, N. J.—The Jersey City Plan Commission has issued a report recommending the opening and widening of certain streets with a view to providing better access to a new trolley terminal from the business section of the



STREET OPENINGS PROPOSED BY JERSEY CITY PLAN COMMISSION.

city. As will be seen from the accompanying diagram, the plan consists of the opening of two new streets from Jordan avenue at its present terminus at Vroom street, one connecting with Jones and one with Summit avenue. The plan also includes the widening of both Jones street and Summit avenue.

Girl as a Road Builder

Altoona, Pa.—Miss Margaret Moore Ellis, aged 20, has become an efficient aide and roadmaster in Supervisor D. S. Hyle's district of Frankstown township, Blair county. She superintends the operation of a log drag and oversees the work on a five-mile stretch of Scotch Valley road. Miss Ellis is animated by a genuine love for the cause of good roads and is one of the few women of Pennsylvania who take an active personal interest in the betterment of the public highways.

County Works for Better Highways

Forsyth, Ga.—The road commissioners of Monroe county have purchased a large 45-horsepower traction engine for use on the county roads. Tired of the plans in vogue in the past, when the convicts were simply used to repair washed-out roads, they are to change this system and build permanent roads. To this end they have purchased the engine, which, it is estimated, will do the work of some 25 mules and do it more satisfactorily. Several different concerns have had their machines here making a demonstration; each make was given a trial over some of the county's bad roads. An engine was finally purchased from the International Harvester Company. As a result of the crusade by the Monroe County Good Roads Association the commissioners have furnished split log drags to the farmers in the different sections of the county and these the farmers have pledged themselves to use on the roads in front of their property after the hard rains. In this way the roads can be kept in good shape and the convict gang can be utilized in making permanent improvements. The city of Forsyth has been using the scrapes and drags on her streets, and notwithstanding the severe rains of the winter her roads are in better condition than in years.

Funds of Over $300,000 Available for Highways

Trenton, N. J.—Estimates of the probable receipts of the motor vehicle fund as made by State Road Commissioned Edwin A. Stevens indicate that there will be available from this source for use on the highways of the State this year a sum between $275,000 and $325,000, which is about $70,000 less than last year's receipts. The loss will be due largely to the operation of the automobile reciprocity law passed by the legislature after a notable contest over the proposition. The total amount needed in the State for road repairs is $1,380,052. In 1909 the apportionment of money by the State for road repairs amounted to $362,000; in 1910 the sum was $308,000; in 1911 it was $345,000, and this year it is $325,000. There are about 2,000 miles of improved highways in the State. State Road Commissioner Stevens desires to apportion $6,000 from the motor vehicle fund for use in preparing a map of the proposed State highway system.

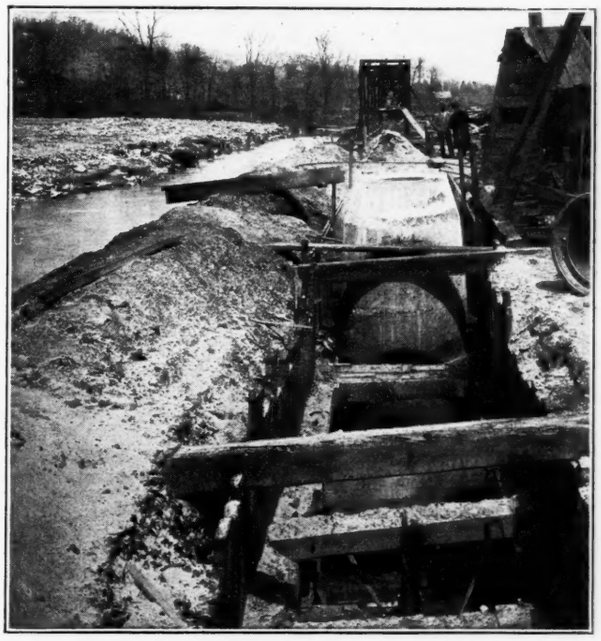
Galveston Causeway Soon to Be Opened

Houston, Tex.—Houston people are preparing for the Galveston causeway opening in a thorough manner. At a recent meeting held in that city it developed that upward of 1,000 automobiles are to be in the procession that will come from Houston over the magnificent shell roads to engage in the opening celebration. These machines will be decorated in a manner suitable to the occasion and there will be many Houston banners in the line. Organization of this Houston contingent to the causeway celebration is being arranged in a manner that is sure to make the showing very gratifying to Houston and Galveston alike. With 1,000 automobiles in line it may easily be figured out that the Houston visitors will extend along the road for more than half the distance between the two cities. It will take more than one hour for these machines to cross the causeway, even if they make good speed and move at reasonably short headway. There has never been a longer or better parade of automobiles in Texas than this from Houston to Galveston promises to be. When it is considered that other cities will be represented in the parade and that the Galveston automobiles will be out in full force, the magnitude of the pageant over the causeway on the opening day will be appreciated. Houston has been active with Galveston interest in the causeway in urging its construction and insisting upon the great value it would be to this city and the territory contiguous thereto.

SEWERAGE AND SANITATION

Nepperhan Valley Sewer Construction

Yonkers, N. Y.—The picture below shows the progress of work on the Nepperhan valley sewer. Favored by good weather, Contractors MacDonald and Murray have been able to make up for the time they lost recently on the Nepperhan valley sewer construction as the result of the record rains which flooded the excavations they had made.



Courtesy Yonkers *Herald*.

CONSTRUCTING NEPPERHAN VALLEY SEWER.

Such progress has been made within the last few weeks that the contractors have no doubt that they can complete the work within the time specified in the contract. The contract was one of the largest awarded by this city for a public work in some time, the successful bid being in excess of $100,000. The sewer will be built in two sections. One section is being built now and is almost completed. It runs from Lake avenue to Second street. The common council has called upon the city engineer to submit the plans for the second section, which will extend from Second street to Barney street. This section may not be completed for a year. The contractors are digging the sewer with the aid of a trench excavator, which is seen in the background.

City Buying Dead Flies

Cleveland, O.—In answer to an offer of the city to pay a reward of a cent for every 10 flies delivered dead at the city hall, school children of Cleveland are "swatting the fly" with vim and vigor. The crusade will continue for two weeks, when the offer expires. The city health officials believe that every fly killed at this season of the year means the absence, so to speak, of nine flies later. Hence the posting of the reward.

New Drainage System Under Way at Last

Savannah, Ga.—After many months of preliminary work the engineers of the H. S. Jaudon Engineering Company have now begun work upon the survey for the new house drainage system of Savannah for which a $600,000 bond issue was recently passed. Many months will be required now on this before the plans will be complete and the excavating and installation of the pipes will begin. The corps now engaged in the work consists of five members. The eastern section of the city will be surveyed, after which it is likely that the force will be shifted to the southern section. The proposed drainage system will cover the entire city and will give Savannah one of the most complete systems in the country.

Law Passed on Use of Common Towel

Haverhill, Mass.—In accordance with the provisions of chapter 59 of the acts of 1912 the State Board of Health at a regular meeting has voted to make these regulations as announced by Secretary Mark W. Richardson: On and after June 1, 1912, it shall be unlawful to provide a common towel: (a) in any building used as a public institution, hotel, restaurant, theater, public hall or public school; or (b) in any railroad station, railroad car, steam or ferry boat. The term "common towel," as used in these regulations, shall be considered to mean a roller or a towel available for use by more than one person.

Improved Sewerage System

Glen Rock, Pa.—Glen Rock's sewerage system as it has been improved and extended is said to be adequate enough to carry off a great quantity of water. If a flood such as swept over the borough last July is experienced again the damage will be comparatively small. A conservative estimate places the loss to the town and individuals at from $40,000 to $50,000.

Site Selected for Sanitary Market

Boston, Mass.—Boston is to have a sanitary market. A site near Copley square has been selected and the Women's Municipal League is going to undertake this much-needed step toward civic betterment. A desirable lot has been decided upon for the erection of a building which will be a model of its kind. It is near Copley square and easily accessible by several lines of cars. This market will be constructed of the most approved materials, with non-absorbent and dustproof finish, facilities for care in the handling of foodstuffs, etc. Control over sources and quality of the food itself will also be included in the plan.

Solution of Sewerage Problem Suggested

Washington, D. C.—The effort to provide for the proper disposal of sewage in Montgomery and Prince Georges counties, Md., which is threatened with a delay of two years as a result of the failure of the Maryland legislature to appoint a committee to prepare a survey for the project, may be revived through action taken by the Montgomery County Medical Society requesting the State Board of Health of Maryland to proceed in the matter as far as it can in the absence of legislative authority. The society at a meeting held at Rockville adopted the following resolution: "Resolved, That this society extends the request to the State Board of Health of Maryland to take such action as is within its power for the appointment and financing of proper committees from Montgomery and Prince Georges counties toward accomplishing the proper disposal of sewage in the respective counties adjacent to Washington, D. C., acting in consonance with a committee to be appointed by Congress for the District of Columbia for the same purpose."

To Treat Sewage from Pawtucket

Providence, R. I.—The city of Pawtucket will begin the work of connecting its sewer system with the Providence system in order that its sewage may be treated at Field's Point at once. The project includes the building of a main to connect with the main which has been extended in this city to the city line on Pomfret street. When completed the new main will carry the sewage of the western part of Pawtucket down to Field's Point to the precipitation plant, where it will be treated with the Providence sewage.

In working out the plans for the installation Pawtucket has developed a special type of meter for measuring the amount of sewage that passes through the main into this city. This meter includes a screen, a regulating and a measuring chamber. The sewage enters the meter through a coarse screen which will strain out all the heavy substances. The material then flows into the regulating or orifice chamber which divides the flow in case of a storm, permitting the storm water to escape into the Moshassuck river, but confining the sewage matter to the main. In this chamber the flow is regulated by a float valve which opens and shuts the gates to the river. A recording device in the measuring chamber records the height of the sewage at all times and gives the amount of flow over a "V notch" weir, by which the volume of the discharge is computed.

WATER SUPPLY

Year's Supply of Water in Storage

Holyoke, Mass.—That the city has at the present time nearly a year's supply of water stored in the municipal reservoirs was the text of the report submitted to the water board by City Engineer T. J. McCarthy. For the week ending April 13 there was an estimated total of 1,626,000,000 gallons, which, allowing a daily consumption of 100 per capita gallons, would supply the city's residents with water for a considerable length of time.

Last Section of Water Main Laid

Newburgh, N. Y.—The illustration shows the laying of the last piece of pipe of the new 30-inch main from Washington lake to Newburgh. This new pipe is intended to

Courtesy *Newburgh News.*
LAYING WATER MAIN IN DEEP TRENCH.

relieve the situation in case a break should occur in the old one, and will thus afford two sources to bring the water into the city instead of the one used up to this time. The work was attended by great difficulties throughout its entire construction. The Hudson Terminal Company started the job but soon went into the hands of receivers. The receivers attempted to carry on the work but were forced to give it up. The Hallock & Angle Co. then took over the contract, and in spite of many obstacles carried it through. A large part of the task was tunnel work, the pipe being down to a depth of 30 feet. It went over a narrow right of way which had been secured by the water commissioners extending from Little pond to Newburgh,, and often came very close to the old pipe, which was crooked and went in many directions. When this original tunnel was completed it was never filled in, and for that reason, when the new line met it, the earth fell in and a new tunnel had to be dug. Latterly these landslides have occurred with such frequency that it was necessary to dig an open ditch instead of a tunnel, at a depth of 30 feet. With the laying of this piece of pipe the water could be turned into the city at once if necessary, but before doing so it is deemed more feasible by the commissioners to flush out the pipe and clean it thoroughly, emptying the water in Quassaick creek. It is probable that very soon the pipe will be in actual use, for the reason that with it the water to the city can be under direct control from the lake, whereas with the old main it is controlled at the Lockwood basin, and the old gate house at the lake is now completely submerged by the great volume of water there.

Ely Will Purify Its City Water

Ely, Minn.—Ely is planning to protect water users from any possible epidemic of typhoid or any other disease that might possibly result from an impure water supply. The water supply is secured from Long lake and is considered to be very pure and wholesome, but the city council decided to run no risks, so ordered the city engineer to ascertain what the cost would be to erect a purification plant in connection with the water and light plant, authorizing him to secure data, plans and specifications.

Geologist Reports Supply of Pure Underground Water

Moorhead, N. D.—That Moorhead has available a practically unlimited supply of pure artesian water is the opinion of W. H. Winchell, former State geologist of Minnesota, who has been investigating the matter. In a written report, filed with City Clerk R. G. Price, Mr. Winchell says that to the east of the city there is an underground artesian lake, which in all probability extends from the city limits of Moorhead east into the hilly country through the eastern part of Clay county. Mr. Winchell estimates the depth of this underground lake at the city limits east of Moorhead to be 125 feet. The hard pan which forms the crust over the lake is 68 feet in thickness, according to his estimates. Mr. Winchell recommends mechanical handling of the water and in this connection has this to say: "It is for the commissioners of the department to devise the mechanical handling of this water in order to make it of use to the city. But since it is known to rise somewhat above the level which (above) is taken for its head, it might be made to overflow into a reservoir directly from the well, and in this case the expense of pumping it into a reservoir could be obviated."

Fayetteville Will Build Large Reservoir

Fayetteville, N. Y.—For the purpose of increasing the storage capacity of its water works from 1,500,000 to 10,500,000 gallons, Fayetteville will build next summer a 9,000,000-gallon auxiliary reservoir. This improvement, it is expected, will not only take care of the water needs of the village for years to come, but will enable it to sell water to consumers outside the corporation limits. The law permits a village to sell water to outsiders provided it has a surplus. After its new reservoir is completed Fayetteville, according to engineers' calculations, will have a large surplus of wholesome water even during periods of drought. A number of property owners along the Genesee turnpike, in the town of Manlius, have indicated their desire to secure a supply. The estimated cost of Fayetteville's new reservoir is $13,000. This is to be paid from the proceeds of a $15,000 bond issue. The village has acquired sixteen acres of what was formerly the Nightengale farm as a site for the new reservoir and as a means of further protecting Palmer creek, the source of supply. The 9,000,000-gallon reservoir will be on the same level and connected with the present one, the capacity of which is 1,500,000 gallons. The two reservoirs will be for storage purposes only, as ordinarily the flow of water is directly from the stream into the village mains.

Municipal Plant Pumps 600 Gallons Per Capita

Niagara Falls, N. Y.—For several days past the municipal water plant has been pumping 19,000,000 gallons of water per day of 24 hours. Of this amount, according to members of the Board of Water Commissioners, about 6,000,000 is for the use of the private company, while the balance about 13,000,000 gallons, is for the customers of the municipal plant. This is an average of about 613 gallons per capita of population, figuring the population of the city at 31,000, and the members of the commission declare that this is an excessive average. There is a big waste of water somewhere, and the commission will institute an investigation shortly to ascertain just where it is and stop it if possible," said one member of the commission, while discussing the matter. "Just imagine each man, woman and child in the city using about twenty barrels of water a day!" he exclaimed. "Why, I'll wager that there are some who don't use a pint a day. There may be many who use more, but it will not average up more than 600 gallons a day." The commissioner stated further that the municipal plant is now being taxed beyond its capacity, which is 18,000,000 gallons a day. However, he stated, the analysis of the water showed that it is just as pure as before the city began supplying the private company a couple of weeks ago. The private company's new filter plant is almost completed, it was learned, and it will be put in operation within a few days.

Extension of Water Main

Milford, Conn.—The New Haven Water Company has completed the extension of a large main from Sea Side avenue west along the new road a little over one mile. This large main will give the cottagers of Silver Beach a better water pressure for use than they have had in the past.

Chemist Praises Filtration Plant

Fargo, N. D.—Ora C. Ayliffe, Lorain, O., who will have charge of the new filtration plant at Fargo, says that the plant is one of the best in the country and that it will remove 98 per cent. of the impurities from the water. "We expect the plant to be running in about one month, but it will be about the middle of July before the testing will be done, and this will be done only when the city council directs it to be done. The work will be under the direction of Expert Brown of Chicago. The plant at first will have a capacity of 4,000,000 gallons per day, but this can be increased to 6,000,000 whenever necessary."

City Saves $1,500,000 on Cost of Aqueduct

Los Angeles, Cal.—The total cost of the Owens river aqueduct will be $23,000,000, a saving of $1,500,000 over the $24,500,000 bonds authorized. The saving is to be accomplished by not selling $500,000 of the bonds that are now ready for sale and by receiving a salvage of $1,000,000 from the material that will be left when the aqueduct is finished. This information, with much more, is contained in a letter sent recently to Kountze Brothers and A. B. Leach & Co. by the aqueduct officials. The letter is signed by A. A. Hubbard, president of the board of public works, and William Mulholland, chief engineer of the aqueduct. Kountze Brothers and A. B. Leach & Co. form the New York bond buying syndicate that has purchased millions of dollars' worth of the aqueduct bonds and has an option on the remainder of them. A cost schedule is attached to the report showing percentages completed and percentages of cost. Another table shows that $19,717,057 has been spent on the work to date out of an approximate total cost of $24,000,000. In submitting the approximate cost of $24,000,000, which is itself $500,000 less than the estimate, the letter calls attention to the fact that the expenditures include 515,000 lineal feet of conduit cover, costing approximately $1,000,000, that was not included in the original estimate. Concerning the quality of the work done the letter says that, while it is not pretended or claimed that in the 140 miles of concrete lining no cracks or pieces of poor concrete can be found, the extent of such defects is within a reasonable perentage and the work as a whole is good, durable and satisfactory. It is stated the aqueduct will be completed early in 1913.

Will Supply Water for 300,000 Persons

Rochester, N. Y.—The new conduit which City Engineer Fisher desires to have constructed from Hemlock Lake to Rochester will increase the supply of water now received so as to provide for an average of 30,000,000 gallons which will be ample for a population of 300,000 persons. The present average daily consumption of Hemlock water in Rochester is 19,000,000 gallons. The construction of the proposed conduit and the improvements recommended by the City Engineer to be made at Hemlock and Canadice Lakes will cost, it is expected, more than $1,500,000.

Recommends Chemical Treatment of Missouri Water

Leavenworth, Kan.—J. H. Johns, city inspector, has received from C. C. Young, of the chemistry department of the Kansas University, an analysis of the Missouri River water which Prof. Young says indicates that the water is polluted from sewage sources. He intimates, however, that the elements which lead him to this belief may come from surface waters. But he says: "I can say definitely from this analysis that the water should be filtered before being served to the public." In speaking of the minerals contained in the water, Prof. Young says: "At this time of year the Missouri River water is relatively soft, being less than half as hard as it is during the dry months. The magnesium carbonate and the calcium carbonate represent the temporary hardness and can be removed on boiling and is what is known as permanent hardness. In summing up the results of this analysis it is unquestionably true that the Missouri River water can be made a very satisfactory supply if subjected to sedimentation after coagulating with lime and alum or lime and iron, then filtered through a properly designed and properly operated filter. The present supply at Kansas City, Kan., is a very good illustration of what careful operation can do for Missouri River water. They consistently reduce the bacteria below 100 and remove practically all of the suspended matter."

Survey for New Reservoir Site

Torrington, Conn.—The survey for the proposed additional reservoir of the Torrington Water Co. at Hart Hollow is going on rapidly under the direction of Professor Phelps, of the Massachusetts Institute of Technology. The field work is in charge of Ernest F. Robinson, a United States army engineer of wide experience. An enthusiastic member of the surveying party is William M. Doyle, who was connected with the borough engineer's office. A part of the land necessary for increased storage has been secured and other owners are being negotiated with.

Recommends a Change in Water System

Lowville, N. Y.—The Village Board of Trustees has received a communication from the Board of Water Commissioners recommending that, owing to the excessive waste of water, a change be made from the present flat rate system to the meter system and that all takers of water be required to install meters by July 1.

The village is to furnish the meters and the property owners to pay the expense of installation. The communication has been approved by the board and the installation of meters for consumers has been authorized. Prior to the act nearly all consumers have had the flat rate and the net revenue from the water works system has been $4,500 a year. The water commissioners claim that the meter system will reduce the net revenue about $2,000 annually, but it will guarantee sufficient water to meet all demands.

STREET LIGHTING AND POWER

Electric Lights for Silver Spring

Silver Spring, Md.—Silver Spring, one of Montgomery's most rapidly-growing towns, is preparing to install electric lights. A movement is also on foot for the erection of a town hall, part of which will be used as a library.

Investigating Various Lights

Erie, Pa.—In accordance with their policy for a "Great White Way" along State street, the members of the Business Men's Exchange have been investigating the various lights that are available for street lighting and Secretary A. M. Howes has become enthusiastic over the new Luminous lights and it is likely that samples of these will soon be erected in Erie to give the business men an opportunity of comparing them with other lights now in use.

Company Will Put Wires Underground

Hartford, Conn.—The Connecticut Company, which operates the trolley roads of the New Haven Railroad, is about to spend $200,000 in putting underground all its wires in the center of the city of Hartford, as the result of a conference between the city's representatives and its lawyers. Long since the Hartford city government ordered these wires underground and there has been since then a sustained legal controversy over the matter. Also there is now before the State Public Utilities Commission a petition asking that the company be required to do this. It will require something over two miles of conduits to take care of the wires in the center of the city.

City Installs Its Own Lights

Eugene, Ore.—Notwithstanding a temporary setback in its plans to light the business district of Eugene with current from the municipal electric plant, through an order from the Oregon Power Company to take the new lights off the wires which support the trolley of the street railway company, the City Water Board is going ahead with the work of installing the system, and is putting the lamps on wires of its own strung across the streets and suspended from the business blocks, permission having been obtained from the owners of enough of the buildings to insure a complete lighting system for the business district. These lights are only temporary, and will be taken down when the new cluster system is installed, which will be some time this Summer. Aside from the electric signs in front of the stores, which, fortunately, are numerous, there have been no lights on the business streets for nearly two weeks. When the Oregon Power Company ordered the city lights taken off the street railway company's wires, Mayor Berger canceled the contract with the power company to furnish lights on the business streets. When these temporary lights are installed the city will have a complete street lighting system all over the city.

New Arc Lights Installed

Huntington, W. Va.—Nearly four hundred new "magnetite" arc lights have recently been installed by the Ohio Valley Electric Railway Company, in line with many other improvements that are being made. As a result Huntington is now lighted not only more brilliantly, but also with fewer discrepancies in the general system, because the new type of lights goes out far less frequently than the old style and requires less attention. A great decrease in the number of "outs" has been noticed, it was stated by Roscoe Woltz, superintendent of lighting. He said that in many places the "tungsten" lights had been installed, especially in the outlying districts.

Proposes Magnetite Light for Municipal Plant

Dallas, Tex.—City Electrician Leon M. Taylor states that in figuring estimates for installing a municipal lighting plant with connections to furnish all lights for the streets he will use the magnetite light, having found this light much cheaper to maintain than the common arc light, while furnishing an equal amount of light. Mr. Taylor said that the cost of power to run a magnetite light is only about one-third to one-half what it is to operate an arc light of equal power, the magnetite requiring three to four amperes while the arc light requires an intensity of seven to eight or even nine amperes. He estimates that it will probably cost $51 per light for this type.

Last of "New Center" Arches Are Removed

South Bend, Ind.—The last of the arch lighting system in the downtown section of South Michigan street known as the "new center," has been removed to make room for the more modern boulevard lights, which have been installed generally throughout the business district. The "new center" merchants have signed a contract with the Indiana & Michigan Electric Company for the new lights. Work of installing them on the east side of Michigan street between Jefferson boulevard and the Grand Trunk Western Railroad will be started at once. The lights in the "new center" differ slightly from those in other portions of the business section. The posts are higher and the lights are brighter.

FIRE AND POLICE

New Chief Tests Hose

Wheeling, W. Va.—The new Chief of the Fire Department, Edward T. Rose, is making a thorough examination of all the hose in the department. All sections found to leak under pressure from a fire engine are thrown out. Another excellent plan is being carried out. Firemen from the various houses are delegated to examine buildings in their vicinity with a view to familiarizing them with the conditions that would be met with in case of fire.

Auxiliary Water System Nearly Completed

San Francisco, Cal.—On May 1 water will be let into the reservoirs and the tanks and pipe line of the high-pressure water system for fire protection. The reservoir on Twin Peaks will be filled with 10,000,000 gallons, the pressure-regulating tank on Clayton street, between Seventeenth and Eighteenth streets, will also be filled, and water will be turned into thirty-one miles of mains in the streets of the city. The pumping station at Townsend and Second streets also will be placed in commission ready to pump any quantity of salt water from the bay into the pipe system should such a supply be necessary to supplement that from the Twin Peaks reservoir.

Fire Damages Property in Southern City

Columbus, Ga.—Three firemen were injured and property loss estimated at $300,000 was caused by the most destructive fire in the history of the city on April 25th. Nearly two blocks of residences were destroyed.

Smoke Helmet Tested

Hazleton, Pa.—The fire committee of councils recently met for the purpose of testing a smoke helmet purchased by the city. The apparatus was taken to the Armour beef house, where a fire had been kindled in a smoke house. Chief Burkhart donned the apparatus and entered the place, which was thick with smoke. He carried an electric lamp and experienced no other discomfort than to become thoroughly saturated with perspiration, caused by the excessive heat. After making his report the committee accepted the helmet and recommended the payment of the bill.

AUTO APPARATUS NOTES

Auto Apparatus of Various Types Received and Tested by Many Cities—An Unusually Well Equipped Chief's Car for Topeka—Busy Day for Denver Autos

Anaconda, Mont.—Bozeman recently installed an up-to-date combination chemical and hose wagon. Montana cities are rapidly coming to the front as users of motor fire apparatus. Anaconda has now contracted with the Webb Motor Fire Apparatus Company, of St. Louis, for a duplicate of that car. Its construction is special in the fact that it is particularly designed for efficient work either on the steepest grades or on long stretches of bad road.

Muncie, Ind.—The cut illustrates the new automobile lately purchased by the Board of Safety for Fire Chief John Casey, to be installed at the No. 1 station. The car is a

Courtesy Muncie *Sunday Star*.

FIRE CHIEF'S NEW CAR.

forty horse-power and equipped with all the latest devices, including a self-starter. The machine is gray in color, with bright nickel-plated lamps and trimmings. As soon as the new auto is put in service the horse and wagon which has been in use for many years will be sold. With the new car Chief Casey will be able to reach a fire in the suburbs of the city by the time either of the suburban departments reaches the blaze. The auto will be equipped with one or two chemical tanks.

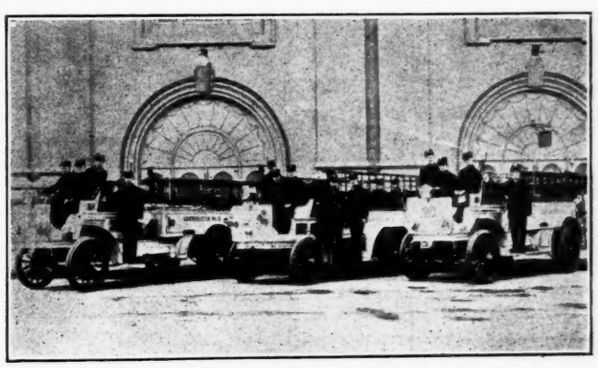
Hartford, Conn.—A triple combination fire wagon constructed by the American-La France Company, of Elmira, N. Y., was given a thorough demonstration and test when the machine arrived in Hartford in charge of three employes of the La France company, on its way to Danbury for a demonstration. Arrangements were made for a test in this city. The machine, which has a gasoline-driven engine, showed a capacity of more than 700 gallons of water per minute. The test was witnessed by Chief Augustus Loomis, First Deputy Chief John C. Moran and by several fire commissioners.

Lynn, Mass.—Loaded with 900 feet of hose, all other equipment and 13 men, a demonstration of the hill climbing qualities of a Locomobile combination hose and chemical motor truck was given the city officials. The first test was a climb of Bay View avenue, off Western avenue, and with Mayor Connery, Commissioner McPhetres and eleven men the truck went over the hill from a standing start at a 10-mile clip. Chief Harris and Deputy Chief Ray were at the bottom of the hill watching the test and were well pleased with the showing. The wagon is a combination of chemical and truck, carries 1,000 feet of hose and all the men that can get aboard. It is equipped with a 45-gallon tank, two extension ladders, two axes, two plaster hooks, four lanterns, two hand chemicals, pinch bars and several small appliances. The regular hose is packed in the bottom of the body, as in regular wagons, and above this, just back of the driver's seat, is the chemical hose on a reel. The engine is a four-cylinder Locomobile engine of 53 horsepower, and good for 54 miles an hour. In front of the driver's seat is a large searchlight for throwing light into dark alleys or on the burning building. The full equipment is up to date and seemed to please the officials, who expressed satisfaction in most every particular. Two more machines are to be tried out in the near future and the best for Lynn selected.

Vancouver, B. C.—The fire department of Vancouver are the recipients from the Webb Motor Fire Apparatus Company's factory of an 85-ft. four-wheel gas and electric drive Webb motor aerial hook and ladder truck. In the road tests preliminary to shipping, this truck was tested out through the heaviest of the winter's snow. It easily negotiated St. Louis' steepest hills and deepest snow drifts without hesitation or inconvenience. Many visitors, who witnessed these demonstrations, expressed their approval and satisfaction in the operation of the apparatus, the quick and simple raising mechanism and the great ease with which not only the aerial equipment is handled, but also the handling of the car through narrow streets and under other conditions which are always a problem in the handling of 85-ft. aerial trucks.

Hoquiam, Wash.—Fire Chief George McAlvey, of Tacoma, recently spent a day in Hoquiam inspecting the fire demonstration of the newly installed automobile combination fire engine and hose wagon. The apparatus is the first automobile engine in the State. The pump is operated by the same engine that draws the machine to the fire. Several types of these engines have been perfected by eastern factories, but they have not met with the approval of all critics. "The engine worked very satisfactorily," said Chief McAlvey upon his return to Tacoma. "It has a 101 horse-power motor, with a guaranteed capacity of pumping 500 gallons of water per minute. In the demonstration it pumped 725 gallons per minute. It is not the kind of engine we want in Tacoma at present, however. There is no need of our discarding the reliable and almost new steamers in service here for the more up-to-date apparatus. What we need, and probably will get next year, is automobile chassis to be placed under the fore wheels of our steamers. Then we can reach the fires without automobile engines as quickly as we do with the other automobile apparatus, and will still be able to rely on the trustworthy steam pumps for the heavy work." With Chief McAlvey was C. L. Conrad, assistant superintendent of the Tacoma fire alarm system. Several other fire officials from northwestern cities attended the demonstration, including Chief Stetson, of the Seattle department, and his chief mechanic.

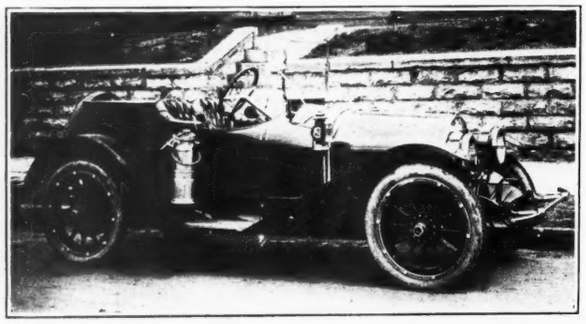
Denver, Colo.—During a recent heavy windstorm the local fire department responded to twenty-eight calls in less than fifteen hours, making the day one of the busiest in the history of the department. Engine Companies 2 and 11 each responded to six alarms. There were five fires reported within a period 21 minutes. The quick runs made by the different companies and the rare judgment used in handling good-sized blazes during the gale plainly demonstrated the efficiency of the department, and no doubt saved Denver a large property loss. The work of the motor-propelled fire-fighting apparatus was particularly effective. The three combination chemical engines and trucks were all out on a number of trips during the day and made a new record for themselves. The combination, stationed at city hall, for instance, responded to an alarm at the Denver & Rio Grande railroad shops; the fire was slight, but the round trip was made in just thirteen minutes. A horse-drawn fire engine would have consumed nearly an hour in making the trip.



MOTOR APPARATUS OF DENVER FIRE DEPARTMENT.

Middletown, Conn.—Two years ago there was put into use at fire headquarters an auto truck and since that time the machine has been sent out 139 times to answer alarms of all kinds. The whole expense for operation during the two years has been $99.74, divided as follows: Gasoline, $23.20; oil, $4.90; tires, $29.75; sundries, $43.81. During the same two years horses have been maintained at fire headquarters to draw the truck and at No. 3 to draw the hose wagon, and the cost to the city has been $1,909.41.

Calgary, Alta.—Frank M. Woodward, for a number of years one of the principal delivering engineers for the Webb Motor Fire Apparatus Company, and well known to many of the fire officials throughout the country, has been appointed in charge of the motor section of the Calgary, Alberta, Fire Department. At the present time this division embraces four pieces of up-to-date motor fire apparatus.



Courtesy *Topeka State Journal.*

FIRST INSTALMENT OF TOPEKA'S FIRE DEPARTMENT MOTOR APPARATUS.

Topeka, Kan.—The first piece of motor apparatus for use in the Topeka Fire Department service, the chief's wagon, is now installed in engine house No. 2. In a few days another motor will be set up in this city—a combination chemical-hose wagon. The chief's wagon is a powerful car, built by the Overland company, 45 horsepower, with a speed of 55 miles an hour. The apparatus weighs 3,000 pounds, has a wheel base of 118 inches. The new machine will be in fighting trim for all fires in their "infancy." With three chemical fire extinguishers, one fire axe, electric flashlights, emergency tools and "first aid" packets, it will be ready for action both day and night. The "first aid" packet is a new thing on Topeka fire apparatus. For persons burned with gasoline or gas, cuts and bruises the applications will be sufficient to relieve pain. Two of the chemical extinguishers on the car will be used specially for fires in automobiles, garages, gasoline, oils, paints, turpentines, acetylene, lamps, explosions, electrical fires and fires from overheating. The car is finished in English vermillion, the regulation department color, nickel-plated and well trimmed. Electric headlights, front, side and rear. A latest improved rotary chime bell is fastened to the side of the car.

Butler, Pa.—J. S. Winans, W. H. Funkhouser, L. R. Jackson, H. M. Rowl and H. H. McCreary, councilmen of New Brighton, have been in the city to make an inspection of the auto fire truck at central station. The visitors were accompanied by a Pittsburgh representative of the Pope-Hartford company, which built the machine for the Butler Fire Department, the Beaver valley town being in the market for the latest in fire department equipment. The visitors were not only well pleased with the machine in use here, but also complimented the town on its handsome building and well-arranged quarters and equipment.

Detroit, Mich.—Detroit has a new automobile fire engine. The new car is long and low, with symmetrical curves and most graceful proportions. It is bigger than any of the auto apparatus purchased by the city. That it will be a big factor in fighting fires was demonstrated to the satisfaction of the fire commissioners, Chief Broderick, Secretary George Stockwell and a score of firemen. The builders of the machine assert that the new engine will throw 750 gallons of water in a minute without exerting itself to any appreciable extent. Two lines of hose were attached to the new engine and two streams of water were thrown from the deck of a fireboat. The engine is a 110-horsepower, six-cylinder affair, with a 162-inch wheel base. It has solid tires instead of pneumatic. Verne M. Robinson, vice-president of the Robinson Fire Apparatus Manufacturing Company, says it will make a speed of 35 miles an hour.

Nashville, Tenn.—Before Mayor Howse, Chief Rozetta and several fire chiefs from surrounding cities the automobile fire engine, which has been on exhibition here, gave a demonstration on the public square of the power of the engine for throwing water. The test was made through 1,000 feet of hose and threw a stream of water over 200 feet in the air. The engine is of the American-La France type, and has been sold to the city of Columbus, Ga. The machine, under the management of Mr. Wient, made a good impression on the gathering of chiefs, and all were loud in their praises.

GOVERNMENT AND FINANCE

Commission Government Accepted

Tampa, Fla.—At its last election commission form of government was carried by an overwhelming majority.

No Funds for Salaries

New Castle, Pa.—The city officials and employes will draw no money this month and, possibly, not before June 1, when the 1912 taxes begin to come in. The appropriation ordinance, which provided the cash to conduct all city departments since the first of April, has not been passed and is a subject of controversy in councils. No money will be paid out until this ordinance is passed and signed.

City Engineer's Report on Salt Lake City

Public improvements made in Salt Lake City during 1911 by the engineering department of the city amounted to more than three-quarters of a million of dollars, according to the annual report of the city engineer. The report asserts that Salt Lake is in the front rank of the cities of the country in the matter of improvements. The document was started by former City Engineer G. F. McGonagle before he went out of office, and was completed by D. H. Blossom, the present city engineer. During the year Salt Lake spent $790,466.50 on improvements. The city now has 26.621 miles of asphalt pavements; 3.4 miles of stone and asphalt pavements; 3.2 miles of macadam pavements, making a total of more than thirty-three miles of paved streets within the city limits. It also has 304.649 miles of sidewalks, 70 miles of curbing and 166.016 miles of sewers. The lots and acreage of the city are valued at $25,440,419, while the improvements are valued at $19,209,655, and personal property valued at $16,517,787, making a grand total of valuation amounting to $61,167,861. There are 42.56 miles of double track street car lines in the city; 29.10 miles of single track, and 114.32 miles of siding.

Total receipts for the engineering department for the year amounted to $114,052.78. Modern fireproof stables, wagon sheds, machine shops, storehouses and a garage were constructed during the year, and the teams of the city and its equipment are now housed together in modern buildings, instead of being scattered in all parts of the city, wherever quarters could be secured. In addition there was constructed 3.34 miles of water supply mains; 2.05 miles of asphalt pavement; 42 miles of sidewalk; 5.92 miles of curb and gutter, and 5.32 miles of sewer laterals.

The engineering department has laid down more restrictive rules regarding the laying of new sidewalks. Instead of having a three-inch concrete foundation with an inch cement mortar wearing surface, sidewalks are now constructed with a concrete of a mix considerably richer than the one used previously, and they will be solid, without a cement surface. To conform with the new style of sidewalk construction, a rule was adopted whereby curb and gutter contractors would be obliged to use the same mix with no mortar facing, so as to produce a monolithic formation. One of the most interesting features of the report is a summarized recapitulation of the total cost of the city sewer system. The city has represented in its investment in iron pipe, and in this property owners have a large interest, more than $2,248,000. Half of this sum has been invested during the past five years. During 1907 the sum represented in the sewerage system of Salt Lake approximated but little more than a million dollars.

STREET CLEANING AND REFUSE DISPOSAL

Municipal Collection of Garbage Started

Cortland, N. Y.—Municipal collection of garbage has been instituted in Cortland. The work is done under the direction of the Board of Health. One of the six wards of the city will be covered each day. As the weather grows warmer the collections will be doubled, there being a collection each third day.

Paris to Clean Up in May

Paris, Ky.—Paris will have a clean up day early in May. It was stated several weeks ago that Mrs. Robert Goggin, chairman of the Civic Committee in the Progressive Culture Club, was arranging for a general cleaning up of the city, and that Mayor Hinton had promised co-operation, and would put the city carts at the disposal of the committee for that day. Members of the Paris Literary Club will also cooperate. The work will be done the first week in May, the exact date to be announced later.

Cynthiana's Clean Up Day

Cynthiana, Ky.—The City Council has selected two days as general clean up days for the city. All persons are ordered to collect all filth and rubbish on their premises and place it in easy reach of the wagons that will be furnished on these dates by the city free of charge. Premises will be inspected after these dates, and anyone not complying with this demand will be subject to a fine. In compliance with an ordinance passed by the Mayor and Board of Council, on February 12, all persons on sanitary sewer lines must connect with the sewer before July 1, 1912.

River Bottoms Used for Refuse Disposal

Dallas, Tex.—Many people passing over the viaduct have commented upon the unsightly dump grounds by the river bottoms; a scene considered by most persons quite out of harmony with the general prospect otherwise. The city has recently arranged for other dumping grounds in South Dallas, and will not continue to heap trash upon the dump near the viaduct. Street Commissioner Lee said that it was the plan, eventually, to cover the array of tin cans and refuse. The covering is to be done by the placing of dirt swept from the streets upon the pile. The present plan does not contemplate the hauling of any other dirt than street sweepings, and it is not known just how much time will be required for the dump to be covered in this way.

RAPID TRANSIT

Double-Step Car Is Given Trial

Bridgeport, Conn.—The Connecticut Co. has tried out, upon some of its lines in this city and upon the New Haven line as far as Woodmont, one of the new "double step" open cars which will be used during the coming summer if it is found to work practically. This is the type of car which the company was requested to put in operation by the Daughters of the American Revolution and which the Public Utilities Commission ordered the company to provide for half of their equipment before July 1 next. This car has a double step, making the climb to get aboard from the street less than upon the type of car in use last summer. It was tried upon some of the city lines, and appeared to be satisfactory, although Superintendent C. H. Chapman said that it would require further test to find out whether they can be used in all places or not. There are many places where the street is narrow between the curb and rail, and the new step takes up a little more room. He said he "hoped" the car would prove very satisfactory, but that the test would be continued, and until all of the conditions of operation are ascertained. Mr. Chapman said that the company has a number of these cars ready for service at any time, more in process of alteration, and that by July 1 the full quota required, and perhaps more, would be ready. Some of the cars being altered are new double truck cars received too late for use last summer and have not yet been used over the lines. If the new double step car proves satisfactory and practical, it will mean a great deal of comfort for the woman of the city who found the high steps of the open cars of the double truck type difficult to enter and leave.

MISCELLANEOUS

State Gives Trees to City

Cleveland, O.—Twenty thousand pine trees have been presented to the city by the State forestry department, and the movement to cause a Schwarzwald to spring up along Cleveland's inner and outer park belt is now on in earnest. City Forester Boddy said State authorities are intensely interested in the plan to establish State forest reservations along the valleys near Cleveland. The city soon will ecoverr 10,000 small trees, mostly white pine or cypress.

$20,000,000 for Port Work

Seattle, Wash.—Twenty million dollars is what Gen. H. M. Chittenden, chairman of the port commission, estimates is now pledged to be expended for the development of Seattle's harbor during the next five years. In an estimate entitled "Going Some," furnished by General Chittenden, that official places the total amount of public fund pledges for harbor improvements at $13,500,000, and the amount of funds, public and private, in prospect at $6,500,000.

Less Noise in Newark

Newark, N. J.—Under the new traffic ordinance just passed by the Newark, N. J., City Council, the automobilist who misuses his warning signal is made guilty of a misdemeanor, and liable to a fine. This requires that every automobile shall be equipped with an adequate signal, and defines such a signal as one producing an "abrupt note, sufficiently loud to be heard under all conditions of traffic," but restricts its use to times when it is "necessary as a warning of danger." The ordinance is the outcome of a consistent attempt to obviate the needless noise evil and at the same time to increase the safety of the streets. Not only has the careless and indiscriminate use of automobile signals been a source of much annoyance from the standpoint of noise, but it has been pointed out that such misuse materially lessens their effectiveness when necessary in their true function as means of warning. The restraining measure has the sanction of all reasonable motorists as well as the general public.

Wage Scale for Public Work

Pasco, Wash.—At the meeting of the City Council Mayor J. H. Sylvester secured the passage of his wage scale ordinance. The ordinance as passed and now a law, provides a minimum wage scale of $2.75 for an eight-hour day on all municipal work, with time and one-half for overtime. The fate of the measure has been in doubt for some time, in spite of the fact that local unions were lined up behind Mayor Sylvester advocating the measure. The fight was principally centered upon what the minimum amount should be, some of the councilmen claiming that $2.50 a day was enough, and while the Mayor wanted $3 set as the minimum scale, rather than see the measure defeated he compromised at the figure of $2.75. This ordinance will now be a part of all future contracts for municipal work. The passage of the ordinance is looked on as a personal victory for the Mayor.

Publicity Scheme for Southern California Cities

Los Angeles, Cal.—A special train is to be sent from Southern California next fall to cover the continent and make stops at sixty-five leading cities of Canada and the United States. It is intended to boost the whole of Southern California and is a big scheme to attract people to Southern California next winter. There will be moving pictures shown, much literature will be distributed, and a big band will be taken along to give free concerts. Long Beach, Los Angeles and other cities have signified their intention to appropriate money in order to be represented on the train. The special train will be out eighty-five days. There will be an exhibit car—a moving exhibition of Southern California on wheels. An advance agent will be sent to every one of the sixty-five cities to herald the coming of the special. He will hire the best theatre in every town and advertise that a free band concert and moving-picture show will be given. The cities represented on the train all will have an equal amount of space on the moving-picture film and each will be represented in the literature to be distributed.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Defect in Streets—Duty to Repair

Barron v. Town of Watertown.—Where a portion of a sidewalk in a city, where the alleged defect existed which was claimed to have caused plaintiff's injuries, had been used by the public and maintained by the town since 1874 as a portion of the traveled part of the town, the town was bound to keep it in repair, though the walk at the place of the accident extended about an inch beyond the street line.—Supreme Judicial Court of Massachusetts, 97 N. E. R., 622.

Water Supply—Exclusive Franchise

Ennis Water Works v. City of Ennis.—A municipality owning the source of a water supply and part of the mains granted to a citizen, his heirs and assigns, the right and privilege to supply the city and the inhabitants thereof with water for domestic and other uses, and for preventing and extinguishing fires, and authorized him to use the streets for the laying of mains. Held, that the grant was an exclusive one in the nature of a monopolistic franchise, and so invalid, because contrary to constitution.—Supreme Court of Texas, 144 S. W. R., 929.

Injuries to Pedestrians—Falling Branches

Lundy v. City of Sedalia.—Notwithstanding an adjoining proprietor has a property right in trees growing along the sidewalks in the streets, the city may remove them, if they are obstructions to travel or constitute a nuisance in some other respect. That an injury from a falling limb in a city street was improbable will not relieve the city from liability, as it must guard against all sources of danger that threaten the safety of persons on its streets.—Kansas City Court of Appeals, 144 S. W. R., 889.

Discharge of Surety—Notification

City of Chester v. National Surety Co.—A surety's bond for the performance of a contract for the installation of a filter plant for municipal water works provided that, if the principal should default in performance of the contract or abandon the work, the obligee should immediately notify the sureties. Held that, unless the principal abandoned the work, the municipality was under no obligation to notify the surety of any default until the time limit for performance had expired, because until that time had elapsed there was no default.—Supreme Court of South Carolina, 73 S. R., 38.

Repairs of Street—Protection of Public

Holliday v. Mayor, Etc., of City of Athens.—If a person attempting to travel along a public street is injured by coming in contact with a rope stretched across the street by the municipal authorities in order to close the street for repairs, he cannot recover damages from the municipality, if by the exercise of ordinary care he could have discovered the rope in time to have avoided striking it, or if, after discovering the obstruction, he failed to exercise a like degree of diligence to avoid injury to himself.—Court of Appeals of Georgia, 74 S. E. R., 67.

Construction of Sewers—Assessment

Bell v. City of Burlington. Harvey v. Same. Dankwardt's Estate v. Same.—The necessity of a sewer system, constructed at the cost of the property served thereby, is not determined by the fact that there may be lots or blocks in the district of such elevation that the waters thereon will flow off either to adjacent property or into the streets, without a sewer, and that such property is not enhanced in value, since the general welfare and future prospects of the city's growth and consequent needs are to be considered, and the present market value is not a decisive test.—Supreme Court of Iowa, 134 N. E. R., 1082.

Board of Education—Liability for Torts

McCarton v. City of New York et al.—The Board of Education of the city of New York is liable for erecting or maintaining on a school building, with notice that it is unsafe, a flag pole in a position endangering the lives of those lawfully in the vicinity.—New York Supreme Court, 133 N. Y. S., 939.

Defective Sidewalks—Liability

Duffy v. City of New York.—A city is not liable for an injury to a pedestrian from a defect in a sidewalk consisting of a depression not exceeding three or four inches in depth at its deepest point, though it has existed for a year.—New York Supreme Court. 133 N. Y. S., 974.

Repeal of Charter—Public Improvements

Batchelor v. Town of Hammonton.—The statute of 1909 applies to the town of Hammonton and repeals so much of its charter as is inconsistent therewith, and, as the statute confers upon the governing body of any municipality the power to institute proceedings for improvements named therein, without the application of the owners of the lands affected thereby, it grants an additional power inconsistent with the charter, which must give way to subsequent legislation; and the proviso that nothing therein contained shall prevent any governing body from exercising "powers now conferred" relates to powers not repealed, either expressly or by implication.—Supreme Court of New Jersey, 82 A. R., 525.

Fire Prevention—Combustible Material

Neumann v. Mayor anl Council of City of Hoboken et al.—The charter of the city of Hoboken empowered the council to regulate the manufacture anl keeping of gunpowder, fireworks and other dangerous and combustible articles, and the city's building code prohibited the erection of any building for the manufacture or repair of mattresses or any other article wherein excelsior or other combustible material was used, or the storage of such materials within certain distances of designated buildings. Held, that the word "combustible" was broad enough to include articles likely to cause a conflagration, and that ordinary materials for mattresses were within the class of articles prohibited by the code.—Supreme Court of New Jersey, 82 A. R., 511.

Appeal for Assessment—Conditions

Dunn et al. v. City of Superior.—Owners of land assessed in proceedings to pave a street, under Statutes 1898, as added by Laws 1909, in ignorance that an assessment had been made upon their property without giving credit, for the amount paid upon a previous assessment therefor, although knowing that the street had been previously paved, presented a written application for an extension of the time of payment of the assessment for benefits, which conformably to Statutes 1898 contained an agreement that, in consideration of the privilege of extension, the applicants would make no objection to any want of power or irregularity in regard to the assessments, and afterwards, on discovery of the previous assessments, requested to withdraw their application. Held that, although the city had taken no action on such applications, the complainants, on accepting the privilege, had relinquished their right to contest the validity of the assessment, and elected to accept the benefits of an extension; and hence that such applications could not be withdrawn.—Supreme Court of Wisconsin, 135 N. W. R., 145.

Right to Lay Water Pipes—Annexed Territory

City of Norfolk v. Norfolk County Water Co.—A real estate company platted a tract near Norfolk City, reserving to itself the fee in the streets with the right to lay water pipes, and afterward conveyed to a water company the right to lay water pipes under the streets, covenanting not to convey to another the right to do so. Acts 1901-02 annexed such territory, designed therein as "Park Place," as a part of the city; but section 15 provided that nothing in the act should affect any easements theretofore granted in the streets of the annexed territory, and that the city should not acquire any water mains then laid in the territory, except by condemnation. In 1903 the real estate company conveyed to the city all its rights reserved in the plat, by a deed which dedicated all of the streets to the public, "save only as to such easements and rights in said streets as the grantor may have conveyed to others." Held, that neither under section 15 nor under the deed to the city could the water company claim the exclusive right to lay pipes under the streets of the annexed tract, so that the city could lay water mains thereunder, and the fact that it might become a competitor of plaintiff was immaterial.—Supreme Court of Appeals of Virginia, 74 S. E. R., 226.

NEWS OF THE SOCIETIES

Fourth National Conference on City Planning

The program this year is peculiarly practical and should appeal alike to engineers, architects, landscape architects and students of sociological problems. There will be an attempt to show just what city planning can do for certain types of areas and how the bills incident to improvement or reconstruction can be paid. There will be group sessions on city planning and housing and on city planning and the problem of circulation. One paper will deal entirely with the method of popularizing city planning or "Campaigning for a city plan." Boston is preparing a very generous welcome and I hope you will be able to be present.

Monday, May 27, His Honor, Mayor John F. Fitzgerald, will give a luncheon to members of the conference from 12 to 2, which will be followed by a city planning automobile tour for members of the conference.

Opportunity will be given to examine the collection of material relating to city planning and the work in this field at Harvard University, especially in the departments of landscape architecture, architecture, history and government and social ethics.

Sessions of the conference will begin Monday evening and close Wedesday afternoon. The following subjects will be discussed:

1. The Meaning and Progress of City Planning—Papers by Frederick L. Olmsted, Fellow American Society Landscape Architects, of Brookline; Arnold W. Brunner, Fellow American Institue Architects, of New York; George F. Swain, Professor of Civil Engineering, Harvard University The papers and discussion will consider the development of the city planning idea, the growth of city planning organizations, the methods of campaigning for a city plan, and the attitude of the engineer toward city planning.

2. City Planning Studies of Specific Areas—"The Problem of the Blighted District," J. R. Coolidge, Jr., Fellow American Institute Architects, of Brookline; "The Public Street Systems of the Cities and Towns About Boston in Relation to Private Street Schemes," Arthur A. Shurtleff, Fellow American Society Landscape Architects, of Boston. The papers and discussion will consider the social and economic value of planning ahead for different types of areas.

3. How the City Planning Bills Are to Be Paid—Papers by Nelson P. Lewis, chief engineer Board of Estimate and Apportionment, New York City; James A. Gallivan, street commissioner, Boston. The papers and discussion will consider a more equitable distribution of the cost of public improvements.

4. The "Zoning" Principle of Germany Applied to the United States. —Paper by B. A. Haldeman, assistant engineer in charge of city planning, Bureau of Surveys, Philadelphia.

One session of the conference will be left open and the questions discussed will be chosen from suggestions of members of the conference and others interested in the subject of city planning.

The following topics have already been suggested:

1. Transit and the Housing Problem.
2. How can the proper distance apart of thoroughfares suitable for carrying car lines best be determined?
3. The effect of the motor truck on the location of factories and the distribution of population.
4. The co-ordination and co-operation of municipal departments having charge of municipal improvements.
5. What can properly be laid down in the way of theory or ideals concerning the system or systems of circulation in present day cities?
6. The advantages of the use of motor busses over trolley cars.
7. The use of excess condemnation to eliminate slums.

The sessions will close with a dinner at which the members of the conference residing outside of the metropolitan district of Boston will be invited guests.

The speakers will be announced later.

The annual membership fee of five dollars entitles members to all the privileges of the meeting and to a copy of the Proceedings. These privileges include the mayor's luncheon, the automobile trip, and in the case of members residing outside of the metropolitan district of Boston, cards to the closing dinner. Members residing within the metropolitan district may receive cards to the dinner on payment of the subscription price of two dollars.

Delegates from cities or civic organizations and others interested in the subject of city planning who do not wish to take membership in the conference may receive cards to the conference sessions on application to the secretary, and on payment of the subscription price of two dollars, may receive cards to the closing dinner.

The secretary of the conference, Flavel Shurtleff, 19 Congress street, Boston, will be glad to answer inquiries.

New York State Association of Police Chiefs

State President Goodrich has commissioned J. M. Ballard to secure data for the blue book of the chiefs which is to be issued in June, and as a side issue to visit merchants and business men of the cities in the hope of putting the relations of the police force and the community before them in such a manner that the police may have the support, confidence and co-operation of all citizens in their work. The book, which is to be published by the association, will contain half-tone photographs of all the police chiefs of the State, together with biographical sketches.

Short Ballot Organization.

Secretary R. S. Childs, 383 Fourth avenue, New York City, has announced that the organization is about to make an addition to the Digest, consisting of a revision of the bibliography, reports from some of the commission governed cities, and the outlines of a number of new commission government charters. The secretary will be glad to furnish these at two cents per leaf, plus postage. The number of leaves to be added in the next insertion will be about twenty.

American Civic Federation

At a recent meeting of the Executive Council of the Civic Federation's Department on Regulation of Interstate Municipal Utilities, it was announced that Dr. John H. Gray, Professor of Economics at the University of Minnesota, who has made many special investigations for the United States Bureau of Labor, is to head an investigation designed to determine how far regulation of public utilities may go without interfering unduly with management.

Prof. Bruce Wyman, of the Harvard Law School, has been appointed counsel for the investigation. William D. Kerr, formerly of the Wisconsin Railroad Commission, and I. L. Scharfman, of Boston, formerly Professor of English Law in the Imperial Pei Yang University, will also assist Dr. Gray. All the State and Federal public service laws will be compiled and "sliding-scale" and "profit-sharing" schemes in Europe will be studied. The investigation will cover telephone companies, steam and electric railroads, and water, gas, electric and water power companies.

These are the various committees and their chairmen: Rates, Franklin K. Lane; Control of Service, Martin S. Decker; Control of Capitalization, Milo R. Maltbie; Franchises, Riewett Lee; Accounts and Reports, Leo. S. Rowe, and Ways and Means, Franklin Q. Brown. Emerson McMillin is chairman of the department. The Executive Committee is composed mainly of public Service Commissioners, railway presidents and heads of other large puasi-public corporations, and representatives of those branches of organized labor that are employed by such corporations.

New York State Mayors' Conference

New York State mayors are being asked by the officials of the State Conference of Mayors to express their opinion as to the feasibility of establishing a central municipal bureau of information. The establishment of such a bureau is being considered by the conference officials, and as soon as all the mayors have expressed their opinion a tentative plan will be drafted and presented at the third conference at Utica in June.

The conference advisory committee has asked each mayor in the State to answer these questions:

In your opinion does your city expend $100 annually (in time of officials, traveling expenses, postage and stationery) to obtain necessary information and statistics relative to municipal problems and improvements under consideration or contemplated? Is the present method of gathering this information and are these statistics satisfactory? Would a central bureau for the collection and distribution of all information and statistics relative to all phases of city government and various municipal problems increase the efficiency of city administration? Do you believe there is need in this State for such a bureau? In your opinion would your city help to support such a bureau, provided its share of the expense was not greater than the total amount now being spent by it to get municipal data? If it is found that the mayors believe there is need in this State for such a bureau the conference will undoubtedly undertake to organize and run it. It is the opinion of several prominent mu-

nicipal officials, according to President Duryee, of the conference, that a central bureau would be very valuable to the cities of the State both from an economic standpoint and as an aid for greater efficiency in municipal work.

Intermountain Good Roads Association

Preparations are being made for the convention to be held at Logan, Utah, June 12-14. Letters have been sent to officials of States, counties, cities and associations throughout Utah, Idaho, Montana, Wyoming, Nevada and Colorado, inviting them to send representatives. J. A. Hendrickson is chairman of the executive committee.

The subjects to be discussed at this convention will be the ways and means of securing action by the National Government in constructing and maintaining national highways, the ways and means of instituting interstate highways between the State capitals of all western States, the procuring of more adequate, suitable and systematic laws from the various State legislatures and the United States Congress in relation to public highways, the ways and means of securing better construction and maintenance of county and city streets.

American Electric Railway Association

Eleven officers of the association recently left New York City on an 11,000-mile trolley trip which will take them from the Atlantic to the Pacific coast. The itinerary of the journey will take them as far south as Galveston, Tex., and as far north as Vancouver, B. C.

The purpose of the trip is to establish a better understanding between the public service corporations and the communities they serve. Conferences will be held not only with the managers of electric roads but with municipal officers and civic bodies on the relation between public service corporations and the municipalities.

The trip shows the wonderful growth of electric railways. According to Thomas N. McCarter, president of the Electric Railway Association, there are 1,300 electric railway companies in the United States, operating 42,000 miles of track and 90,000 cars. These lines carry between 10,000,000,000 and 11,000,000,000 passengers annually.

National Road Association of Illinois

At a meeting at Effingham, March 28, an association with the above title was organized for the purpose of promoting the construction of the National Road across Illinois. An executive organization and resolution committee was elected from each county. The officers are: L. B. Bissell, president; M. E. Began, vice-president; J. H. Curry, secretary; E. L. Damron, treasurer, all of Effingham. Another meeting will be held in Greenup, Ill., May 2.

Municipal Engineers of the City of New York

At the regular meeting held in the Engineering Societies Building, April 24, Walter E. Spear, Department Engineer of the New York Board of Water Supply, presented a paper entitled "Progress on the City Tunnel of the Catskill Aqueduct."

George A. Taber, assistant engineer, Department of Water Supply, Park Row Building, has been elected secretary, to succeed Clarence D. Pollock, who has gone to Havana, Cuba, to take charge of paving construction.

Calendar of Meetings

May 7-9.
Oklahoma State Firemen's Association.—Annual Convention and Tournament, Sapulpa, Okla.—J. Bart Foster, Secretary, Chandler, Okla.

May 8.
Maine State Association of Fire Chiefs.—Convention, Augusta, Me.—Chief M. E. Bennett, Secretary, Sanford, Me.

May 14-17.
Texas State Firemen's Association.—Thirty-seventh Annual Convention, Austin, Tex.

May 14-17.
National Fire Protection Association.—Annual Meeting, Chicago, Ill.—F. H. Wentworth, Secretary, 87 Mill Street, Boston, Mass.

May 16-18.
Ohio Society of Mechanical, Electrical and Steam Engineers.—Annual Meeting, Pittsburgh, Pa.—F. E. Sanborn, Secretary, Ohio State University, Columbus, O.

May 27-29.
Fourth National Conference on City Planning.—Meeting, Public Library, Boston, Mass.—Flavel Shurtleff, Secretary, 19 Congress Street, Boston, Mass.

May 28-31.
American Society of Mechanical Engineers.—Special Meeting, Cleveland, O.—C. W. Rice, Secretary, 29 W. 39th Street, New York City.

June 3-8.
American Water Works Association.—Annual Convention, Louisville, Ky.—John M. Diven, Secretary, Troy, N. Y.

June 11-12.
Police Chiefs and City Marshals' Association of Texas.—Convention, San Angelo, Tex.

June 4-6.
Michigan State Firemen's Association.—Thirty-eighth Annual Convention, Kalamazoo, Mich.—A. P. Lane, Secretary, Ithaca, Mich.

June 10-12.
Mayors Conference of New York.—Third Annual Meeting, Utica, June 10-12.—Mayor C. C. Duryee, President, Schenectady, N. Y.—C. C. Capes, Secretary, New York.

June 10-14.
National Electric Light Association.—Annual Meeting, Seattle, Wash.—T. C. Martin, Secretary, 29 West 39th street, New York City.

June 12-14.
Maryland State Firemen's Association.—Twentieth Annual Convention.—Edward Stevenson, Secretary, Lonaconing, Md.

June 17-22.
South Dakota Firemen's Association.—Twenty-eighth Annual Tournament and Convention.—M. H. Mussman, Secretary, Chamberlain, S. Dak.

June 18-20.
Georgia Association of Fire Chiefs.—Annual Convention, Americus, Ga.

June 19-21.
Wisconsin State Firemen's Association.—Annual Convention and Tournament, Reedsburg, Wis.—Fred H. Henry, Secretary, Jefferson, Wis.

June 20-21.
New York State Association of Fire Chiefs.—Annual Convention, Albany, N. Y.—U. G. Lucas, Secretary, Poughkeepsie, N. Y.

June 25-27.
South Carolina State Firemen's Association.—Eighth Annual Convention and Tournament, Rock Hill, S. C.

June 25-28.
American Institute of Electrical Engineers.—Annual Convention, Boston, Mass.—F. L. Hutchison, 33 West 39th St., New York.

June 26-28.
Society for the Promotion of Engineering Education.—Annual Meeting, Boston, Mass.—H. H. Norris, Secretary, Cornell University, Ithaca, N. Y.

July 8-12.
National Municipal League.—Annual Meeting, Los Angeles, Cal.—Clinton Rogers Woodruff, Secretary, 705 North American Building, Philadelphia, Pa.

September 18-19.
New England Water Works Association.—Thirty-first Annual Convention, Washington, D. C.—George W. Batchelder, President; Willard Kent, Secretary.—Headquarters, Boston, Mass.

September 24-26.
Central States Water Works Association.—Sixteenth Annual Convention, Detroit, Mich.—R. P. Bricker, Secretary, Shelby, O.

PERSONALS

HOWE, C. L., Savannah, Ga., has been appointed a member of the Board of Electrical Examiners.

MOSS, GEORGE, Fort Worth, Ark., has been appointed Chief of Police.

VINCENT, J. E., Phelps, N. Y., has been elected Chief of the Fire Department.

ROBERTS, DAVID E., Gallipolis, O., has been appointed Chief of Police.

HEATH, WM., Salisbury, Mass., has been appointed Chief of Police.

SEIBEE, HUGH, Sioux City, Ia., has been appointed assistant city engineer. Mr. Liebee was formerly City Engineer of Yankton, S. D.

SHIPS, GUY L., Chicago, Ill., has been appointed Superintendent of Playgrounds at Louisville, Ky.

TUPPER, FRED W., Walden, N. Y., has been appointed County Engineer.

MASON, FRANK S., Keyport, N. J., has been elected Chief of the Fire Department.

JOERISSEN, FREDERICK, Ilion, N. Y., has been appointed Street Commissioner.

KOTCHEVAR, ANTON, Ely, Minn., has been appointed Chief of Police.

GARDNER, J. C., Niagara Falls, N. Y., has been appointed County Engineer.

SCHAFER, J. C. F., New York City, has been appointed Superintendent of Water Works, at Erie, Pa.

MCDUFFIE, HARVE L., Sherman, Tex., has been appointed Superintendent of Water and Light Plant. P. C. Thurmond has been made City Engineer.

RESSEGUIE, DR. F. J., Saratoga Springs, N. Y., has been appointed Health Officer.

MEEKER, ROB'T A., Plainfield, N. J., has been appointed State Highway Engineer and Deputy Commissioner.

CLOW, WM., Coxsackie, N. Y., has been made Superintendent of Water Works.

WILLS, JOE. B., Dallas., Tex., has been appointed Chief Sanitary Officer of the city.

TITUS, S. K., Arkansas City, Kan., has been reappointed City Engineer.

The following Mayors have been elected:

SOUTH DAKOTA.

Watertown.—H. A. Wagner.
Mitchell.—A. E. Hitchcock.
Lead.—Harry Howard.
Parker.— —— Kyes.
Ashton.—B. F. Sheridan.
Belle Fourche.—James Saults.
Woonsocket.—H. J. Hobart.
Huron.—D. G. Medbery.
Presho.— —— Dierks.
Winner.—E. G. Barnum.
De Smet.—E. F. Green.
Deadwood.—W. E. Adams.

LOUISANNA.

Mermentau.—R. Harrington.
Lecompte.—J. R. Moore.
Church Point.—Laurent Barousse.
Angie.—F. N. K. Adams.
Morgan City.—Sam'l Witkins.
Pineville.—Mike Aron.
Pearl River.—M. W. Lauer.
White Castle.—Gus Weill.
Estherwood.—Joe Faulk.

FLORIDA.

Tampa.—D. B. McKay.
Gainsville.—Christopher Matheson.

MARYLAND.

Laurel.—Geo. W. Waters.

CONNECTICUT.

New Britain.—Joseph M. Halloran.

TENNESSEE

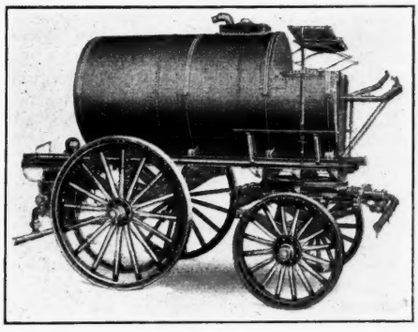
Mountain View.—Joseph M. Meek.

MUNICIPAL APPLIANCES

Studebaker Distributors for Oils, Tars and Asphalts

The Studebaker Corporation, South Bend, Ind., manufactures distributors which are suitable for distributing oils, tars and asphalts in accordance with the principles of all systems in ordinary practise. Their heater and distributor spreads hot bitumens by gravity and pressure of vapor. Their automatic pressure distributor spreads cold bitumens by pressure created by a pump. These machines and some details are shown in the illustration.

The heater and distributor consist of a rectangular steel tank, capacity 500 gallons, mounted on a platform spring running gear, adapted for a two or three horse hitch. The tank is fitted with tubes placed vertically throughout the interior, through which the heat passes from the burners which are located beneath the tank in an asbestos lined fire box, the fire box covering the full area of the bottom of the tank. The heat is thus applied throughout the mass in a very efficient manner. The burners are of special design, adapted for burning kerosene oil. They are simple in construction, non-carbonizing, controlled

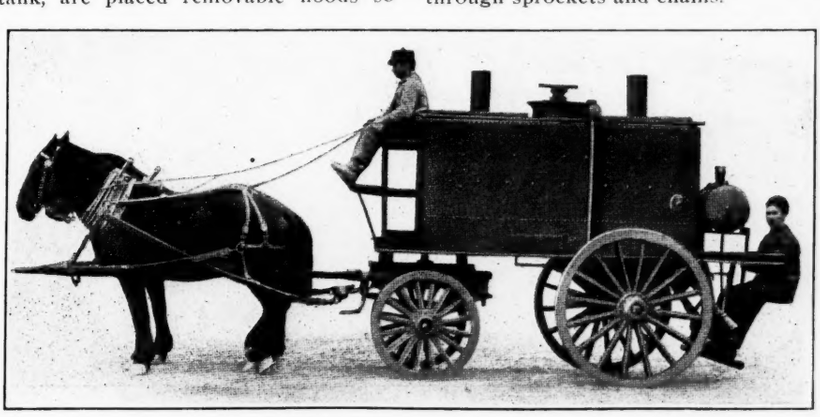


PRESSURE DISTRIBUTOR.

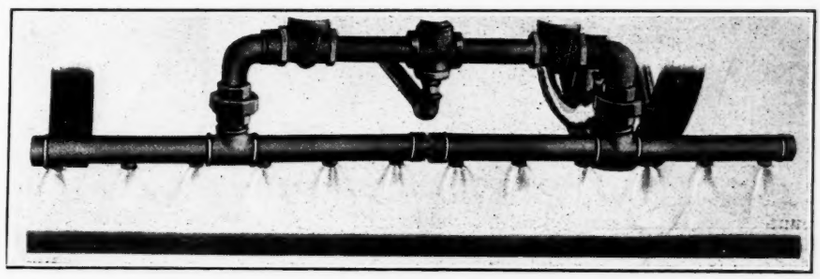
by needle valves affording instant and absolute control of the heat to any desirable temperature, as indicated by a thermometer attached. Fuel oil is supplied to the burners under air pressure from a reservoir and air pump at the rear of the wagon. The delivery valves are placed inside the rear end of the fire box, where they are kept hot by burners. The manufacturers state that the valves and spray tubes will not clog even when the heaviest material is used. Over the heating tubes, on top of the tank, are placed removable hoods so that they can be readily cleaned. There is a similar device preventing accidental overflow of material. In operation the tank is filled in the usual way from the top, and the filling cover tightly closed. The burners are then lighted, and may be kept burning on the way from the car to the place of operation. When the material is properly heated the needle valves are closed and the delivery valves opened. The material is then distributed in an even and uniform spray in practically any volume desired from one-quarter to one gallon per square yard, the limit required in ordinary practice.

The automatic pressure distributor is used for spreading comparatively light weight bitumens which do not require heating, and this may be classed as a machine for dust laying and road preservation rather than construction. The machine is made to supply the demand for a simple, convenient and practical distributor at a reasonable cost and to displace crude and makeshift apparatus. It is an atomizer, distributing the liquid under pressure in a fine spray or mist which is quickly absorbed by the road surface and creates no nuisance. The valves are self closing and are under the control of the driver from his seat. The distribution is uniform, governed automatically by the speed of the team. The pressure is also automatically controlled. These outfits are furnished with either wood or steel tank, ranging in capacity from 450 to 1,000 gallons. The illustration shows the construction and arrangement of the pump and sprocket gears. The pump is self oiling, self adjusting and free from complication.

The pump is a rotary and derives its power from the rear axle of the wagon through sprockets and chains.



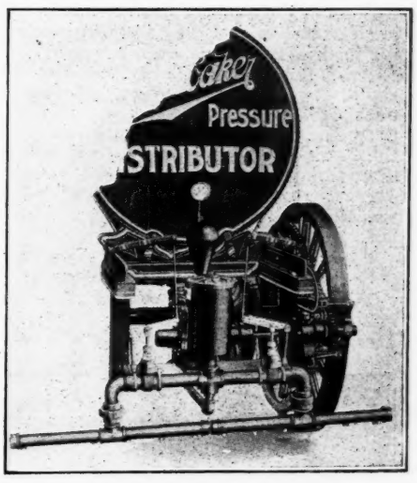
STUDEBAKER HEATER AND DISTRIBUTOR FOR HEAVY BITUMENS.



SPRAYING DEVICE OF STUDEBAKER DISTRIBUTORS.

Weed Killer

The Inter-State Chemical Co., 12 Bayview avenue, Jersey City, N. J., manufacture the Key Brand Weed Killer, a preparation for killing weeds which they state will neither stain the ground nor injure metal, stone or woodwork. The preparation is put up in cases and barrels. Before application to the roadway it is mixed with 40 parts of water. It is spread by means of a sprinkling can or watering cart. The effects of this treatment are said to be much more permanent than the old procedure. Cutting, pulling and digging is always slow, never sure, rarely reaching the roots; expensive and often damaging the roadway. The manufacturers state that one gallon of the diluted mixture will cover 25 square feet of ground and that for several years after an application no growth will appear.



PUMP OF PRESSURE DISTRIBUTOR.

Semi-Automatic Flush Tank

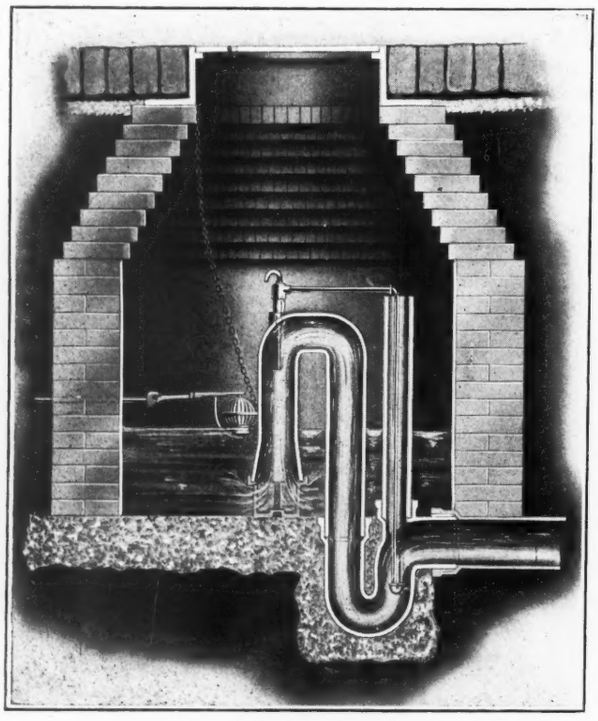
The automatic tank for flushing sewers is usually set to fill and discharge once in about 24 hours. Where less frequent flushing is desired it has generally been necessary to fill the tank by hand, waiting until the tank was full and then discharging the contents into a sewer by removing a plug or valve in the opening. The Merritt semi-automatic flush tank is designed to provide for occasional flushing by hand and at the same time greatly reduce the time of the employe required for the service. This type of tank consists of a standard Merritt automatic siphon for discharging the water and a special type of automatic cut-off valve which admits the water to the tank when a chain is pulled, and automatically cuts off the water as soon as the tank discharges,

so that no more water is fed until the chain is again pulled. An idea of the general design of the Merritt semi-automatic flush tank may be obtained from the illustration.

The operation of the tank is as follows: At the start the float is in the position shown in the illustration, that is, extended to the right, and by its weight holds closed the feed valve. The attendant passing a hook through a hole in the manhole cover, lifts up on the chain and swings the float over to a position above the valve, which opens the feed valve and admits water to the tank.

The water entering the tank gradually fills it and as it rises it lifts the ball float to a position above the joint in the rod. The water rises in this manner until the ball float passes beyond the point of stability, and as it is counterweighted, it is carried over the dead center as the water rises further and submerges it. When the water has reached this level the siphon automatically discharges; and as the discharge occurs the ball float falls with the water level until when the water is all discharged it has resumed its original position shown in the illustration.

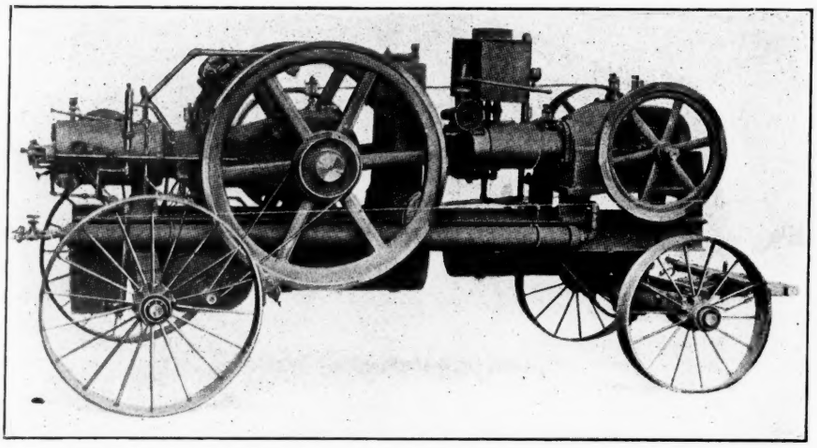
The cut-off valve, which provides for filling the flush tank only when desired and automatically cutting off the water as soon as it discharges, is, of course, independent of the action of the siphon itself, which discharges the water automatically. The tank shown is provided with an overhead siphon type K with shallow iron trap. Any other type of overhead siphon or inverted siphon, type M or N, could be employed. As these siphons are entirely automatic any Merritt semi-automatic tank may be operated automatically by hooking up the chain of the cut-off valve, thus securing continuous feed.



MERRITT SEMI-AUTOMATIC FLUSH TANK.

Portable Gasoline Air Compressor

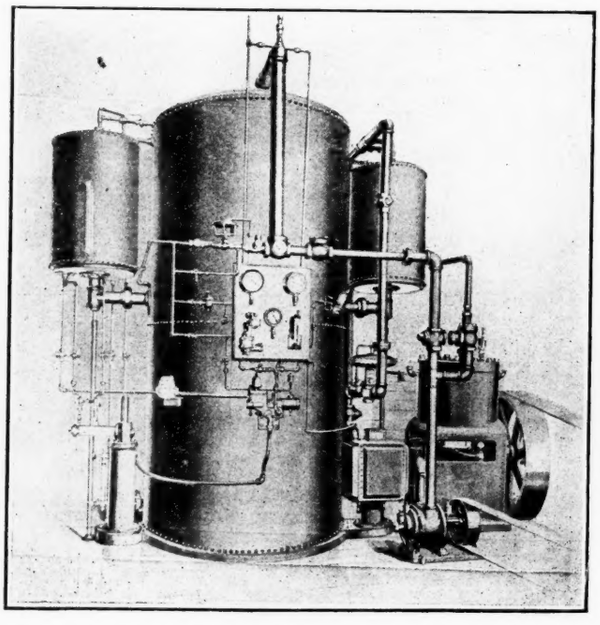
The Quincy Engine Co., Quincy, Pa., manufacture portable gasoline air compressors in sizes ranging from 31 to 155 cubic feet of air per minute. The outfit comprises their standard Quincy engine and a double-cylinder air compressor mounted on a portable steel truck, the steel channel sills of which carry between them the air receiver, which is located directly under the compressor. The leads are attached to the receiver at an easily accessible point, the number of leads being determined by the capacity of the machine. The 3⅝-inch x 5½-inch compressor is of the vertical type with air-cooled cylinders, while the 5-inch x 8-inch and 6-inch x 8-inch are horizontal and with water-cooled cylinders. The water tank is located immediately above the compressor cylinders. The valves are so constructed that they can be removed with removing the cylinder head. By loosening one nut and removing the clamp the valve guide and cage can be lifted out for inspection. The valves open directly into the cylinder from the head, thus avoiding ports and reducing the clearance to a minimum. In these heads the valve guides and cages have ground joints and packing is not required. From the cut it will be seen that the cylinders are side by side and overhang the rigid cast iron base, to which they are securely bolted, and are driven by a double throw crank shaft having a central bearing and wrists at 180 degrees, with counter weights on each set of crank arms. This gives a perfect balance, and, with the liberal length and connecting rod the thrust on the piston is reduced, thus increasing the durability of the machine and admitting of a higher speed. These compressors are all fitted with automatic unloaders, which can be varied by the operator to maintain pressure up to 150 pounds per square inch. These compressors can be mounted on separate truck or on a sub-base for stationary work if desired.



QUINCY PORTABLE GASOLINE OIL COMPRESSOR.

Gasoline Lighting System for Villages and Towns

The Practical Gas Engine & Machine Works, North Chicago, Ill., manufacture and install plants for the production of gas from gasoline by a cold process. The system is suitable for the use of villages and towns varying in population from 400 to 3,000, and plants have actually been installed by this company in 160 municipalities in the



APPARATUS FOR MANUFACTURING ILLUMINATING GAS FROM GASOLINE FOR VILLAGE LIGHTING.

States of Wisconsin, Illinois, Iowa, Minnesota, Nebraska, Michigan and North and South Dakota.

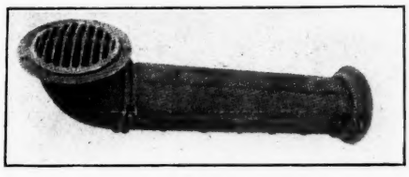
An ordinary 1,200-light plant, large enough for a village of 1,000 population, requires a building usually built of brick, 18 x 24 feet and 11 feet high in the clear. The gas is distributed in pipes, which, however, do not need to be laid as deep as for coal gas, as this gas is non-freezable. The vaporizing or mixing of the gasoline and air is all done in the building and the gas passes from it to the mains. Outside of this building in the rear is a storage tank for compressed air, 5 feet in diameter and 18 feet long, capable of standing a pressure of 100 pounds per square inch. There is also a gasoline reservoir holding 350 gallons placed under ground.

The gasoline is pumped from the reservoir into an elevated gravity feed tank, inside the building, of 70 gallons capacity. Both the gasoline and compressed air pass through governors to the vaporizer. The mixing is done by a pressure regulator which automatically maintains a steady, even pressure. This vaporizing apparatus is the feature of the plant and is claimed to be the only device of its kind on the market. The other machinery, such as gauges, force pumps, and drying apparatus are matters of detail requiring too much space to be presented here.

The gas is measured by meters and sold to consumers by the 1,000 feet. It is stated that 70-candlepower mantle lights using this gas burn 5 cubic feet per hour. The gas is ordinarily sold for $1.50 per 1,000 cubic feet.

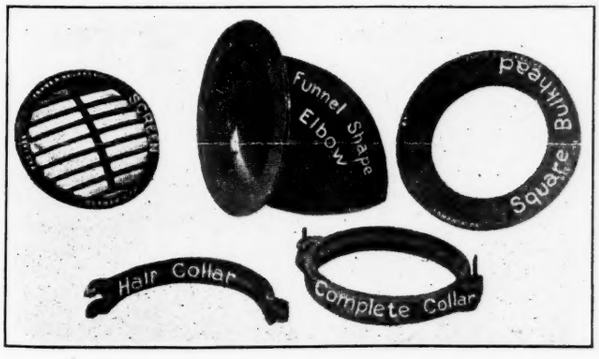
Cast Iron Culvert Pipe

Traub & Helfrecht, Germania, Pa., manufacture cast iron road sluice, culvert pipe and fittings in sizes ranging from 8 to 20 inches in diameter. The



CAST IRON CULVERT AND INLET.

manufacturers state that the pipe is made of the best material obtainable for the purpose and will not rust. The pipe is made in four-foot lengths and of two sections each, as shown in the illustration. The joints are fastened together by a collar made in two sections. Special elbows are made to lead from the inlets to main pipe.



DETAILS OF CAST IRON CULVERT PIPE.

Underwriters' Labeled Fire Hose

The United Globe & Rubber Mfg. Co., Trenton, N. J., make a specialty of manufacturing fire hose in accordance with the specifications of the National Board of Underwriters and under their official supervision and inspection. Representatives of the Underwriters Laboratories, Inc., are stationed at the factory and inspect and attach a label

UNDERWRITERS OFFICIAL LABEL.

to each length of hose. The manufacturer is prepared to furnish rubber hose in 2½, 3 and 3½-inch sizes, and cotton jacket, rubber lined fire hose in 2½ and 3-inch sizes, either single or double jacketed.

INDUSTRIAL NEWS

Concrete Piles.—MacArthur Concrete Pile & Foundation Company, 11 Pine street, New York City, have issued a pamphlet entitled "Some Structures Supported by Pedestal Piles." It illustrates and describes some of the recent work done with Pedestal pile foundations. The structures include freight houses, a large gas tank, a reinforced concrete retaining wall, a viaduct and several apartment houses and factory buildings. In connection with each structure a brief statement is given of the character of the soil and other difficulties encountered in placing the foundation.

Tar and Pitch.—Jobbing parcels are moving in a limited way and quotations remain unchanged at $5.50 to $5.75 for tar and $4 to $4.25 for pitch.

Cast Iron Pipe.—Several large municipal contracts are pending. The general trade is quiet, railroad business noticeably so. Quotations: 4-inch, $27; 6 to 12-inch, $25; 16-inch and up, $24.50. Birmingham—Inquiries are a little better and manufacturers are holding their product very firm. It is expected that an announcement of higher prices will be made soon. There is a good inquiry pending from some of the larger cities. Quotations: 4 to 6-inch, $23; 8 to 12-inch, $22.50; over 12-inch, $21. New York—Private buying continues in satisfactory volume, but public lettings are few and unimportant. Low prices continue to be made by some of the pipe foundries, notwithstanding the belief that order books are in much better shape than at the corresponding time in recent years. Quotations: 6-inch, car loads, $22 to $23. Some makers are still taking orders at $21.

Lead.—Conditions are very quiet. The only feature is an easier market because of independent sellers having cut their prices, and a few sales are reported to have been made as low as 4.10 St. Louis. Quotations: New York, 4.20c.; St. Louis, 4.125c.

Morse Destructor.—The Atkinson-Morse Destructor Co., 90 West street, New York, has been organized to take over the business hitherto conducted by Wm. F. Morse, of designing and constructing furnaces for the disposal of municipal and private waste. The Morse destructors are made in a variety of sizes and designs to handle different quantities and kinds of refuse. They embody certain essential principles, however. The application of forced draft for obtaining high temperatures and rapid combustion has for the first time been employed in small furnaces. The convenient charging of material, introduction and regulation of air supply, maintenance of uniform temperature and removal of residuals, are points of special advantage. The following are recent installations of the Morse Destructor Furnace:

The United States Naval Sanitarium, Fort Lyon, Col.—A steel-cased destructor, enclosed in brick house, destroying all garbage and rubbish from the buildings and the infected refuse from tuberculosis wards of sanitarium.

The Hudson Terminal, New York City.—A brick construction, capacity 10 tons per day, of general refuse from the great office buildings and from the cars of the Hudson Terminal system.

The Loeser Department Store, Brooklyn, N. Y.—A brick construction, burning the miscellaneous waste from two great buildings, using no additional fuel, and operating 150-horsepower B. & W. steam boiler.

The United States Bureau of Animal Industry, Washington, D. C.—A special form of steel-cased destructor, employing gas as fuel, destroying the infected waste from Pathological Laboratory of the Department of Agriculture.

The Animal Rescue League, Boston, Mass.—A brick construction, using gaseous fuel, destroying 800 to 1,300 pounds of animal bodies daily, without nuisance, and at less cost and greater rapidity than any furnace ever built for a similar purpose.

The United States Navy Yard, Boston, Mass.—A brick construction, enclosed in brick house, with radial brick stack, destroying capacity 15 tons daily of garbage and general collection from ships and buildings of the yard. A special design for burning large amounts of saw-dust, shavings and miscellaneous wood refuse by natural chimney draft.

The Bush Terminal, Brooklyn, N. Y.—A brick construction specially designed for disposal of general refuse from the great factories of the Terminal. Connected with 338-horsepower B. & W. boiler, the utilization of heat represents a daily saving of 6 to 15 tons of coal, according to amount of refuse destroyed.

The City of Cambridge, Mass.—A brick construction, operating with chimney draft, destroying unsalable rubbish, small animals and garbage when required, using no extra fuel.

Rapid Mixer.—W. Van R. Whitall, Inc., 103 Park avenue, New York City,

have recently issued a circular entitled "Has Your Experience Been Like This?" This circular is descriptive of good road work, contains specifications and descriptions of the Portable Rapid Heated Asphalt & Concrete mixing and repair plant.

Mortar Tubs.—The Lansing Company, Lansing, Mich., has recently put on the market an all-steel mortor tub for the use of contractors. It is claimed that this tub has many advantages over the old-style wooden box. It is lighter, since it will not absorb water; neater in appearance; cleaner, since mortar will not adhere to it; cheaper in the long run, since it will outwear three wooden boxes. As several of these tubs can be nested in moving them from job to job, they are more easily and conveniently handled. They are made from heavy sheet steel.

Cisco Lead Coated Sheets.—The Cincinnati Iron & Steel Company, Cincinnati, O., has issued a booklet entitled "Cisco Led Kote," describing a new material for roofing which it has brought out. This material is composed of open-hearth sheet steel with a coating of practically pure lead. The company states that under its own patented process the coating is applied without any alloy of tin or zinc, and it is claimed to be the only process in which pure lead has been applied to steel without any alloy. The statement is further made that the metal can be shaped or formed in the most tortuous manner without injuring the coating or the sheet and that it is not affected by sulphuric or sulphurous fumes or by any destructive elements of atmospheric conditions. It is made in gauges running from 16 to 30, inclusive, and in standard widths and lengths of sheets, corresponding with galvanized sheets, from 24 x 72 to 30 x 120 inches, inclusive. Its weight is about 0.03 pound per square foot heavier than galvanized.

Tabulating Machine.—The Spicer Tabulating Machine Company, Washington, D. C., has been incorporated with $200,000 capital stock to develop and market a line of machines designed by Charles W. Spicer for statistical and cost accounting work. The machines are a modification of the mechanical appliances used in compiling the last census and now in use by the Canadian government, adapted to commercial purposes. The company does not contemplate establishing a manufacturing plant at this time, but will have its product manufactured by contract. The officers of the company are J. E. Hutchinson, Jr., president; Charles W. Spicer, an engineer, vice-president, and E. Edmonston, Jr., secretary-treasurer.

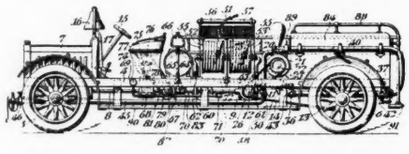
Diesel Engine.—The formal breaking of ground for the construction at St. Louis of the Busch-Sulzer Bros.-Diesel Engine Company's plant took place the past week, the exercises being participated in by Dr. Rudolph Diesel, the inventor, who had come from Germany for the purpose. The plant will cost $500,000. The site cost $350,000.

Asphalt Plant.—It is reported that P. F. Flanigan & Sons, Baltimore, Md., will erect an asphalt mixing plant on Hartford road, in that city. It is understood that the plant will have a capacity for turning out 3,000 square yards of mixed asphalt per day.

PATENT CLAIMS

1,023,141. FIRE-FIGHTING APPARATUS. Harry W. Eisenbise, Reading, Pa. Serial No. 619,093.

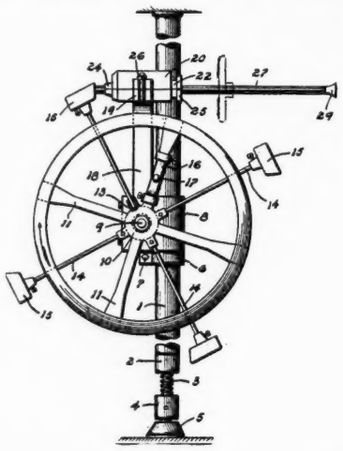
In a fire-fighting apparatus, the combination with a water pump having an inlet pipe, and an outlet pipe for connection with fire-hose, of a chemical reservoir, a second pump arranged to discharge said



reservoir through suitable chemical fire-hose independent of the water fire-hose, and means operative to divert the flow of chemical solution and direct it through said outlet pipe with the water forced therethrough by said water pump.

1,022,578.— PORTABLE ROCK-DRILL. George H. Bibb, Silverton, Col. Serial No. 587,556.

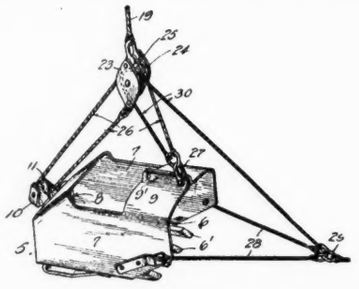
In a machine of the class described, a vertically disposed longitudinally adjustable support, a bearing mounted for longitudinally adjustment on said support, a shaft carried by said bearing, a rotating member on the shaft, resilient arms carried by the rotating member,



hammers on said resilient arms a drill holder mounted on the shaft and rotatably adjusted with respect thereto, and a drill mounted in the holder in the path of travel of the hammers.

1,023,370. EXCAVATING-BUCKET. Francis G. Frink, Seattle, Wash. Serial No. 653,894.

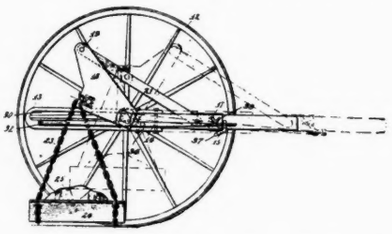
The combination with a bucket, a rope sheave attached to the rear end of the bucket, a hauling line secured to the forward end of the bucket, a hoisting line, a pulley block suspended from said hoisting line, a flexible sling having one end



secured to the forward end of the bucket, thence passing over a sheave of said block and the aforesaid rope sheave and having its other end secured to said block, and a controller line having one of its ends secured to said hauling line, thence passing through said block and having its other end secured to the bucket near its forward end.

1,023,024. STONE-TRUCK. Charles C. McBride, Bisbee, Ariz., assignor of one-half to James Milton Sparks, Bisbee, Ariz. Serial No. 593,633.

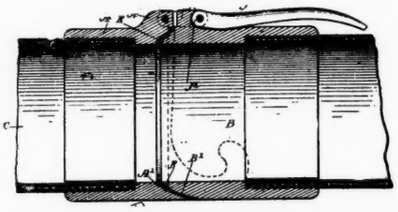
A stone truck comprising a main frame, slots in opposite sides thereof, axles in the slots, wheels on the axles, a



second frame in pivotal engagement with the said axles, a stone board carried by the said second frame, and means engaging the main frame and the second frame thereby, as the main frame is moved relatively to the second frame, the stone board will be elevated from the ground.

1,022,927. PIPE OR HOSE COUPLING. Philo R. Bradley, West New York, N. J., assignor of one-half to George Winkler, West New York, N. J. Serial No. 626,116.

A coupling, comprising male and female members, of which the female member is provided with a conical seat and



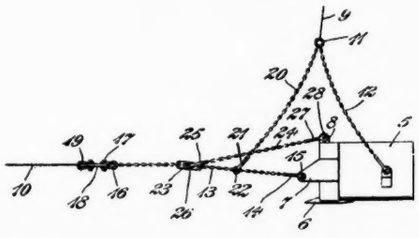
the male member is provided with a conical projection adapted to be seated on the said seat, curved hooks integral on the female coupling member and projecting therefrom and having a web connecting their projecting portions, curved bearings formed in the peripheral face of the male, coupling member and adapted to be engaged by the said hooks, and locking means for locking the said coupling members together, the said locking means and hooks being spaced equidistantly apart.

1,022,371. SANITARY CISTERN. James Alexander Leighton, Estherwood, La. Serial No. 631,208.

The combination with a water spout, of a sanitary cistern for receiving the water from said spout, comprising a receptacle pivoted in the wall of the cistern, and adapted to receive water from the spout when in one position, and to close the cistern when in another position, and automatic means for shifting the position of the receptacle.

1,022,638. EXCAVATING SHOVEL. Chas. A. Morris, Montclair, N. J., assignor to Hayward Company, a Corporation of New York. Serial No. 639.533.

In a device of the class described, a shovel, a fall rope, a haul rope, and a controlling members co-operating directly with the fall rope and the haul rope, said



controlling member being free from connection with the shovel and operating to support the forward end of the shovel and to preclude said shovel from dumping when tension is maintained on said ropes.

THE WEEK'S CONTRACT NEWS

Relating to Municipal and Public Work—Street Improvements—Paving, Road Making, Cleaning and Sprinkling—Sewerage. Water Supply and Public Lighting—Fire Equipment and Supplies—Bridges and Concrete Work—Sanitation Garbage and Waste Disposal—Police, Parks and Miscellaneous—Proposals and Awards.

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also corrections of any errors discovered.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK.	ADDRESS INQUIRIES TO
			STREET IMPROVEMENTS	
Iowa	Albia	May 6, noon	Constrn. cement sidewalks during year	C. C. Atchison, City Clk.
Oregon	Junction City	May 6	Constrn. concrete asphalt or bitulithic pav't	City Clerk.
Indiana	Kentland	May 6, 2 p.m.	Constrn. 2 macadam roads	E. R. Brigham, County Aud.
Indiana	Rushville	May 6, 2 p.m.	Constrn. macadam roads	J. M. Stone, County Aud.
Ohio	Chillicothe	May 6, noon	Constrn. 1.31 miles bituminated concrete	County Commissioners.
New Jersey	Irvington	May 6, 8 p.m.	Constrn. 10-in. Telford pav't with asph. binders, 3-ft. brick gutters, curbing, etc	M. Stockman, Town Clk.
Indiana	Fowler	May 6, 1 p.m.	Constrn. number of roads	L. Shipman, County Aud.
North Carolina	Raleigh	May 6	Constrn. 1 mile macadam road with binder	W. L. Wiggs, Gen'l Supt.
New York	Yonkers	May 6, 3.30 p.m.	Pavg. Kimball avenue	J. V. Mahony, Sec'y.
California	Valejo	May 6	Constrn. 2½ miles macadam	G. G. Halliday, Clk.
North Carolina	Swannanoa	May 6	Imp. 5 miles of road	County Commissioners.
New Jersey	Sea Isle City	May 6	Constrn. macadam roadway	Jacob Wells, Chm. Comm.
New Jersey	Camden	May 6, 11 a.m.	Constrn. concrete culvert	F. W. Gercke, Chm. Comm.
Missouri	Greenfield	May 6	Constrn. 47 miles stone road	J. W. Scott, Engr.
North Carolina	Asheville	May 6, noon	Constrn. 5 miles road	J. C. Valentine, County Engr.
Alabama	Attala	May 6, 8 p.m.	Constrn. 3,700 ft. conc. curb & gutter, also 400 yds. sidewalk	T. C. Banks, Mayor.
North Dakota	Devil's Lake	May 6, 8 p.m.	Grad. streets and avenues	S. C. Jones, City Aud.
Iowa	Sioux City	May 6, 10 a.m.	Constrn. 2,000 ft. cement gutter	G. B. Healy, Supt. Park.
Indiana	Hartford City	May 6, 2 p.m.	Constrn. macadam road	James Cronin, Jr., County Aud.
Indiana	Jefferson	May 6, 10 a.m.	Constrn. macadam road	G. W. Stoner, County Aud.
Indiana	Salem	May 6, 1.30 p.m.	Constrn. 2 roads; cost, $17,000	F. S. Munkelt, County Aud.
Indiana	Warsaw	May 6, 2.30 p.m.	Constrn. 50,000 yds. pav't	County Auditor.
Indiana	Winemac	May 6	Constrn. 8,400 yds. street paving	C. E. Paul, City Engr.
Iowa	Centerville	May 6, 7.30 p.m.	Constrn. cement sidewalks, etc., during season	P. A. White, City Clk.
Iowa	Emmetsburg	May 6, 8 p.m.	Furn. cement crossings, etc	T. F. Rutledge, City Clk.
Ohio	Findlay	May 6, noon	Imp. roads	H. B. McClellan, Township Clk.
Illinois	Sterling	May 7, 7.30 p.m.	Constrn. brick pav't	Board Local Imp.
New Jersey	Newark	May 7, 3 p.m.	Furn. bituminous wearing surface	County Park Comm.
Kansas	Manhattan	May 7, 6 p.m.	Constrn. 13,721 sq yds. asphaltic conc. & 17,721 sq. yds. brick	City Clerk.
Florida	Tampa	May 7, 2 p.m.	Furn. 1,600,000 paving brick, 20,000 ft. granite curbing	D. B. McKay, Comm.
Georgia	Augusta	May 7, 4 p.m.	Constrn. 30,000 yds. paving	Nisbett Wingfield, Comm. Pub. Wks.
Pennsylvania	Olyphant	May 7, 6 p.m.	Constrn. brick pav't and stone curbing	J. F. Cannan, Boro. Sec'y.
New York	Buffalo	May 7, 11 a.m.	Repavg. several streets	F. G. Ward, Comm. Pub. Wks.
New Jersey	Summit	May 7, 8 p.m.	Pavg. with amiesite a number of streets	J. E. Rowe, City Clk.
Florida	Ocala	May 7	Bldg. road	S. T. Sistrunk, Clk.
Virginia	Lebanon	May 7	Gradg. and macadamizing a number of roads	County Supervisors.
Ohio	Akron	May 7, 1 p.m.	Constrn. 2.38 miles bituminated concrete	County Commissioners.
Indiana	Kokomo	May 7, 10 a.m.	Constrn. 2 gravel roads	A. B. Easterling, County Aud.
Indiana	Logansport	May 7, 10 a.m.	Constrn. roads	J. E. Wallace, County Aud.
Indiana	Brazil	May 7	Imp. highway, 15,890 ft. long	E. A. Staggs, County Aud.
Indiana	Vincennes	May 7, 2 p.m.	Constrn. 22,000 ft. gravel roads (3 contracts)	J. T. Scott, County Aud.
Florida	Palatka	May 7, 8 p.m.	Constrn. 52,000 yds. gravel and shell road	S. C. Stallings, City Engr.
Mississippi	Aberdeen	May 7, 2 p.m.	Constrn. 26 miles rock and gravel roads	Good Roads Commission.
Indiana	Decatur	May 7	Constrn. 2 roads	County Auditor.
Indiana	Marion	May 7, 2 p.m.	Constrn. gravel and stone road	E. H. Kimball, Aud.
Indiana	Madison	May 7, 1 p.m.	Macad. and pavg. road; cost, $6,000	A. M. Taft, County Aud.
Indiana	Crawfordsville	May 7, 10 a.m.	Imp. gravel roads	B. B. Engle, County Aud.
Indiana	Greensburg	May 7	Pavg. with brick	Town Council.
California	Stockton	May 7, 10 a.m.	Constrn. macadam road	Supervisors.
New York	Dunkirk	May 7, 8 p.m.	Constrn. 39,000 yds. paving, 19,000 ft. curb	J. N. Hackett, City Engr.
Pennsylvania	Reading	May 8, 2 p.m.	Maintaining 132,000 yds. asphalt for 5 years	E. B. Ulrich, City Engr.
Utah	Richmond City	May 8, 8 p.m.	Constrn. concrete sidewalks, curbs and gutters	N. K. Nelson, Chm. Comm.
New Jersey	Freehold	May 8, 11 a.m.	Constrn. gravel road on Ocean boulevard	J. M. Corlies, Dir.
Maryland	Baltimore	May 8, 11 a.m.	Constrn. sheet asphalt bituminous concrete & brick pav't	Board of Awards.
Ohio	Coshocton	May 8, 1 p.m.	Constrn. 2.37 miles bituminous surface macadam	County Commissioners.
Michigan	Hudson	May 8	Constrn. 8,400 lin. ft. bit. concrete or other pav't	F. R. George, City Clk.
Texas	Gainesville	May 8	Constrn. 35 miles of gravel road	County Judge.
South Dakota	Mitchell	May 9	Pavg. Main st. and intersect. blocks with conc.; cost, $45,000	City Council.
Ohio	Troy	May 9, noon, readv.	Constrn. 1.86 miles macadam	County Commissioners.
Maryland	Towson	May 9, noon	Constrn. 5 miles road	E. S. Bosley, Sec'y Highway Comm.
West Virginia	Moundsville	May 10	Pavg. in Glendale; cost, $14,000	J. E. Chase, County Clk.
Oklahoma	Marble City	May 10, noon	Constrn. cement sidewalks	Will Goins, Town Clk.
Missouri	St. Louis	May 10, noon	Pavg. number of streets	C. A. Moreno, Pres. Bd.
Ohio	Findlay	May 11	Constrn. 9,000 ft. stone road	J. W. Mosier, Township Trustee.
New Jersey	Elizabeth	May 11, 11 a.m.	Pavg. with trap rock, block pav't, bitulithic amasite, Warrenite or other pav't number of streets	J. L. Bauer, County Engr.
Pennsylvania	Harrisburg	May 13 (about)	Constrn. 6 sections of State road	E. N. Bigelow, Comm.
Ohio	Lisbon	May 13, 1 p.m.	Constrn. 2,300 lin. ft. brick pav't	P. R. Walker, County Clk.
Oregon	Eugene	May 13	Pavg. Seventh street	City Clerk.
Michigan	Manistee	May 13, 2 p.m.	Constrn. macadam roads	Road Commissioners.
Iowa	Clinton	May 14	Pavg. Fifth avenue	City Council.
Ohio	McConnelsville	May 14, 1 p.m.	Constrn. 1.23 miles water-bound macadam	County Commissioners.
Ohio	Columbus	May 14, noon	Constrn. crusher bldg	W. E. Hazwell, Sec'y Bd. Admin.
Ohio	Columbus	May 15, noon	Constrn. culverts and repairing aqueduct	A. I. Miller, Ch. Engr. Pub. Wks.
Tennessee	Dickson	May 15, noon	Macad. 8 miles of road	Dickson Turnpike Co.
Arkansas	Pine Bluff	May 15, 2 p.m.	Constrn. 25,500 bituminous wearing surface on gravel	C. M. Philpot, Chm. Imp. Dist.
Georgia	Bainbridge	May 15, 7.30 p.m.	Constrn. 22,000 yds. paving	J. W. Callahan, Mayor; H. S. Jauden, Engr., Savannah.
Michigan	Holland	May 15	Constrn. 1½ miles bit. paving; cost, $45,000	H. A. Naberhuis, City Engr.
Ohio	Madison	May 15 (about)	Constrn. 2 miles macad. road	G. C. Ward, Engr., Painsville.
Ohio	New Phila.	May 15, 10 a.m.	Constrn. 1.55 miles brick road	County Commissioners.
Tennessee	Johnson City	May 16, 7 p.m.	Constrn. 16,600 yds. paving, curb, drainage, etc	T. F. McDonald, City Comm.
Alabama	Montgomery	May 18	Grad. and draining 4 miles of road	W. S. Keller, Highway Engr.
Alabama	Athens	May 18 1 p.m.	Constrn. 7 miles of earth road	W. S. Keller, State Engr.
Indiana	Wayne	May 18, 2 p.m.	Imp. East Haven avenue	L. S. Bowman, County Aud.
Minnesota	Breckinridge	May 20, 10 a.m.	Constrn. 1½ miles of road	P. E. Truax, County Aud.
Alabama	Scottsboro	May 21, 11 a.m.	Macad. 2.7 miles road and grading 6.7 miles	W. S. Keller, Highway Engr.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Texas	Paris	May 21	Constrn. 40 or more miles stone roads & building bridges	W. F. Gill, Sec'y Road Commr.
Alabama	Carrollton	May 22	Constrn. 4 miles of sand clay road	W. S. Keller, State Highway Engr.
Rhode Island.	Providence	May 29, noon	Constrn. 29 miles of State highway	J. H. Edwards, Chm. Bd. of Roads.
Ohio	Canton	June 1	Pavg. Broadway with brick block	R. F. Harbent, Dir. Pub. Serv.
Louisiana	Lake Charles	June 4, 8 p.m.	Constrn. 5 miles of pav't	C. B. Richard, Mayor.
Oregon	Fossil	July 3, 1 p.m.	Constrn. roads and bridges	H. F. C. Heidtmann, County Surv.
			SEWERAGE	
New Jersey	Westfield	May 6, 8 p.m.	Constrn. 5 concrete culverts with c. i. tops, 255 lin. ft.	Chas. Clarks, Town Clk.
New York	Yonkers	May 6, 3.30 p.m.	Constrn. sewers	J. V. Mahony, Sec'y.
Michigan	Bay City	May 6, 9 a.m.	Constrn. 12-in. tile sewer	R. O. Woodruff, Chm. Bd. Pb. Wks.
Iowa	Ft. Dodge	May 6	Constrn. sanitary sewers	W. L. Tang, City Clk.
Wisconsin	Beaver Dam	May 6	Constrn. sewers	J. F. Murphy, Chm.
Iowa	Emmetsburg	May 6, 8 p.m.	Furn. culverts, tiles, etc	T. F. Rutledge, City Clk.
Iowa	Ottumwa	May 6, 8 p.m.	Constrn. several sewers	W. W. Cummings, Chm. Comm.
Wisconsin	Hartford	May 7, 8 p.m.	Constrn. sewers and disposal plant	A. J. Hemmy, City Clk.
Minnesota	New Ulm	May 7, 5 p.m.	Constrn. 1,700 ft. sewers	A. J. Myers, City Clk.
Kansas	Lyndon	May 7	Constrn. sanitary sewers	M. E. Banhauer, City Clk.
Florida	Tampa	May 7, 2 p.m.	Furn. 1,575 ft. 18-in. clay pipe	B. B. McKay, Comm.
Ohio	Cleveland	May 7, noon	Constrn. 17 wooden tanks and laying 1,050 ft. c. i. pipe	W. J. Springborn, Dir. Pub. Serv.
New Jersey	Collinswood	May 8, 8 p.m.	Constrn. surface drains	G. W. Warren, Chm. Comm.
New Jersey	Salem	May 9, 2.30 p.m.	Constrn. 9 miles of clay pipe sewers and disposal plant	W. B. Dunn, City Recorder.
Maryland	Baltimore	May 9	Constrn. reinforced concrete culvert	County Highway Comm.
South Dakota.	Mitchell	May 9, 8 p.m.	Constrn. lateral sewers	N. H. Jensen, City Aud.
New Jersey	**Longport**	**May 9**	**Constrn. sewer system; cost, $10,000**	**Boro. Council.**
Iowa	Ft. Dodge	May 10, 1.30 p.m.	Constrn. drains; cost, $41,000	J. L. Hanrahan, County Aud.
Missouri	St. Louis	May 10, noon	Constrn. sewers	Board of Public Imp.
West Virginia.	Kingswood	May 11, noon	Constrn. 19,000 ft. 8 to 18-in. clay pipe sewer	B. B. Dunn, Mayor.
South Dakota.	Highmore	May 13	Constrn. sewers	C. H. Drew, County Aud.
Iowa	Reinbeck	May 13, 7.30 p.m.	Constrn. 6 miles 8 to 15-in. sanitary sewers & disposal plant	R. B. Ferguson, Town Clk.; Iowa Engr. Co., Engrs., Clinton, Ia.
New Jersey	Newark	May 14, 2 p.m.	Constrn. 7,270 ft. sewer	Passaic Valley Sewerage Comm.
Alabama	Mobile	May 14, noon	Constrn. vit. pipe sanitary sewers, 26,000 ft. 8 to 24-in. pipe	City Commissioners.
Georgia	Sylvester	May 15, 5 p.m.	Constrn. 3 miles 8 to 12-in. sewers and septic tank	R. B. Pollard, City Clk.; J. B. McCrary Co., Atlanta, Ga.
Ohio	Canton	June 15	Extend. storm sewer, Liberty street	P. H. Weber, City Engr.
Minnesota	Willmar	May 15, 3 p.m.	Constrn. 35,000 ft. sewers and disposal plant	Hans Gunderson, City Clk.
Wisconsin	Appleton	May 15	Constrn. clay pipe sewers	E. L. Williams, City Clk.
Maryland	Baltimore	May 15, 11 a.m.	Constrn. high level interceptor, mostly c. i. pipe	Board of Awards.
Wisconsin	Appleton	May 17	Constrn. sewer	E. L. Williams, City Clk.
Florida	Lakeland	May 20, 3 p.m.	Constrn. sewers and disposal plant	C. G. Memminger, Chm. Trustees.
Pennsylvania.	Ardmore	May 28, noon	Constrn. 1,500,000-gal. capacity pumping machinery	R. A. Warner, Engr.
			WATER SUPPLY	
Ohio	Cleveland	May 6, noon	Furn. c. i. pipe and specials	W J. Springborn, Dir. Pub. Serv.
Kentucky	Louisville	May 6, 2 p.m.	Setting fire hydrants	Board Public Works.
South Dakota.	Mobridge	May 6, noon	Constrn. steel tower and tank	M. T. Woods, City Aud.
Michigan	Kalamazoo	May 6, noon	Constrn. two 36-ft. tanks, 70 ft. high	C. L. Miller, City Clk.
South Dakota.	Mitchell	May 6	Constrn. artesian well and appurt	N. H. Jensen, City Aud.
Ohio	Hamilton	May 6, noon	Furn. c. i. pipe and specials, hydrants, valves, etc	J. A. Holzberger, Dir. Pub. Serv.
Iowa	Griswold	May 6	Extend. water main; cost, $7,000	F. B. DeWitt, City Clk.
Nebraska	Louisville	May 6	Constrn. water works; cost, $16,000	C. A. Richey, Chm.
Minnesota	Keewatin	May 7, 8 p.m.	Constrn. 80,000-gal. concrete reservoir	Village Clerk.
Kansas	Lyndon	May 7	Constrn. water works and filtration plant	M. E. Danhauer, City Clk.
New York	New York	May 7	Making borings at reservoir site	Board Water Supply.
New Jersey	Jersey City	May 8, 10.30 a.m.	Furn. c. i. pipe and specials	E. B. See, Clk.
Washington	Wapato	May 8	Constrn. 18,000 ft. 4 to 10-in. wood pipe, etc	Town Clerk.
Indiana	South Bend	May 9	Furn. water feed boilers, two 5,000,000-gal. pumping engines, two 8,000,000-gal. pumping engines; constrn. chimney	W. S. Moore, City Engr.
South Dakota.	Mitchell	May 9	Constrn. 7,500 ft. 4 to 10-in. water mains, etc	N. H. Jensen, City Aud.
Arkansas	Benton	May 10	Constrn. water and sewer systems; cost, $68,000	I. R. Packard.
Iowa	Indianola	May 10, 7 p.m.	Constrn. reinforced concrete reservoir; capacity, approx. 750,000 gal.	A. H. Gilliland, Engr.
Illinois	Compton	May 10	Constrn. steel tank and tower	Chas. Bradshaw, Village Clk.
Iowa	Reinbeck	May 13, 7.30 p.m.	Constrn. extensions	R. B. Ferguson, Town Clk.
Illinois	Odell	May 13	Furn. pumping equipment	A. W. Joerndt, Pres. Trustees.
Canada	Ottawa, Ont.	May 14, 5 p.m.	Constrn. 2 elec.-operated pump. units, 2,000,000 gal. per min.	Water Works Committee.
Wisconsin	Milwaukee	May 15	Constrn. 4,000 ft. 12-ft. water works tunnel	C. P. Dietz, Compt.
Canada	Vancouver, B. C.	May 15, noon	Furn. 2,000 ft. 18-in. steel pipe and gate valves	Jas. Stuart, City Purch. Agent.
Idaho	Salmon	May 15	Constrn. water works; cost, $30,000	F. C. Miller, Con. Clk.
New York	Fayetteville	May 15, 8 p.m.	Constrn. 9,000,000-gal. reservoir and accessories	W. M. Jones, Pres.
Georgia	Sylvester	May 15	Constrn. 4,650 ft. 6-in. c.-i. pipe, etc.; furn. air compressor	R. B. Pollard, City Clk.
Canada	Halifax, N. S.	May 15	Constrn. water works; cost, $100,000	F. W. W. Doane, City Engr.
New York	Olean	May 16	Furn. 2,000 ft. 8-in. c. i. pipe	A. E. Homer, Sec'y Water Comm.
Pennsylvania.	Erie	May 17	Constrn. filter plant, pumping machinery, etc	Commissioners of Water Works.
Florida	Titusville	May 20	Constrn. water works	Geo. M. Robbins, Chm. Bond & Trus
Texas	New Braunfels	May 22, 10 a.m.	Constrn. water and lighting plant	C. A. Jahn, Mayor.
Rhode Island	Newport	May 25, 11 a.m.	Renewing water-piping	Navy Department.
Illinois	Peoria Heights	June 1	Constrn. municipal well water system; cost, $60,000	Village Clerk.
Colorado	Aguilar	June 1 (about)	Constrn. water works; cost, $70,000	City Clerk.
Florida	Lakeland	June 1	Constrn. water gas plant, 150,000 cu. ft. capacity	Lakeland Gas Co.
			LIGHTING AND POWER	
Minnesota	Rochester	May 6	Furn. electrical meters and transformers	W. E. Lenz, City Sec'y.
Ohio	Salem	May 6, noon	Furn. electric current for street lighting for three years	D. H. Rummel, Dir. Pub. Serv.
Kansas	Topeka	May 7, 2 p.m.	Furn. 50-h.p. engine and generator	H. C. Bowman, Chm. State Bd. Con
Ohio	Bryan	May 7, noon	Furn. 250-h.p. crude oil engine, generator, etc	G. F. Solier, Pres. Trustees.
California	Alamada	May 7	Constrn. lamp posts, conduits and wiring	F. E. Brown, City Clk.
Ohio	Bowling Green	May 7, 1 p.m.	Installing street lighting system	C. L. Moyer, Consult. Engr.
Missouri	St. Louis	May 3, noon	Install. navigation lights on bridge	Board of Local Imp.
New Jersey	Freehold	May 8, 11 a.m.	Furn. lighting fixtures for bridges	J. M. Corlies, Dir.
New York	New York	May 9, 2 p.m.	Installing 28 flaming arc lamps in armory	Chm. Armory Board.
Pennsylvania.	Newcastle	May 13, noon	Light. streets with arc and incandescent lights	F. M. Hartman, City Clk.
Canada	Regina, Sask.	May 15	Furn. luminous arc st. light. equip., light. poles, 100-kw.gen-	City Commissioners.
Canada	Ft. William, Ont.	May 15	Constrn. 50-ton incinerator	John Wilson, City Engr.
Texas	New Braunfels	May 22, 10 a.m.	Constrn. power plant, lighting system and transmission line	C. A. Jahn, Mayor.
Louisiana	New Orleans	June 20, noon	Constrn. power house	F. S. Shields, Sec'y.
			FIRE EQUIPMENT	
Indiana	Newcastle	May 6	Furn. 2,000 ft. fire hose	L. M. Johnson, Clk.
New York	New Rochelle	May 7, 8 p.m.	Furn. auto fire apparatus	Board Fire Comm.
New York	Schenectady	May 8, 2.30 p.m.	Furn. 1,000 ft. 2½-in., 1,000 ft. 3-in. fire hose	Board Contract and Supply.
Louisiana	Shreveport	May 14, 10 a.m.	Furn. 1 auto comb. chemical hose wagon & appurt., 2 auto comb. pump engine hose wagons, 1 tractor, 1 chief's car & equipment, 2,000 ft. 2½-in. rubber-lined double jacket standard fire hose, standard screw couplings attached, 9 non-interfering fire alarm boxes, 1 auxiliary fire alarm box, 1 electric bell striker for 1,400-lb. bell, one 15-in. gong and indicator	L. H. Baker, Sec'y-Treas.
Ohio	Canton	May 20 (about)	Furn. equipment for fire department	Thos. Dunwoodie, Dir. Pub. Safety.
South Carolina	Florence	May 22	Furn. 10 fire alarm boxes	W. H. Perry, Chm.
Michigan	St. Joseph	June 1	Furn. 500 ft. fire hose	H. G. Hughson, Chief Dept.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
BRIDGES				
Pennsylvania.	Reading.....	May 6, 10 a.m.....	Repair. masonry bridge.....	D. K. Hoch, County Compt.
Iowa.....	Creston.....	May 6, 4 p.m.....	Constrn. concrete bridge.....	T. S. Delay, County Surv.
Michigan.....	Kalamazoo.....	May 6, noon.....	Constrn. reinforced concrete bridge.....	C. L. Miller, City Clk.
Pennsylvania.	Lewistown.....	May 6.....	Constrn. concrete or rubble masonry bridge.....	Boro. Council.
Ohio.....	St. Clairsville....	May 6, 1 p.m.....	Constrn. 2 concrete bridges at Lamira.....	E. Campbell, County Aud.
Florida.....	Tampa.....	May 7.....	Constrn. Lafayette street bridge.....	Board Public Works.
Indiana.....	Vincennes.....	May 7, 2 p.m.....	Constrn. 9 bridges.....	J. P. Scott, County Aud.
West Virginia.	Marlington.....	May 7.....o.....	Constrn. several bridges.....	C. J. McCarty, County Clk.
Oklahoma....	Chandler.....	May 7.....	Constrn. 42 steel and concrete bridges; cost, $82,000.....	County Auditor.
Indiana.....	LaGrange.....	May 7, 1.30 p.m....	Constrn. 10 concrete and iron bridges.....	C. F. Williard, County Aud.
Missouri.....	Independence...	May 8.....	Constrn. 3 concrete girder bridges.....	R. T. Proctor, County Surv.
Indiana.....	Plymouth.....	May 8.....	Constrn. 8 small reinforced concrete bridges.....	D. F. McCoy, County Aud.
Rhode Island.	Woonsocket.....	May 8, 4 p.m.....	Constrn. concrete arch bridge.....	Comm. Sts. and Bridges.
California....	Ventura.....	May 9.....	Constrn. concrete piers and spans for bridge.....	Board Supervisors.
Ohio.....	Cincinnati.....	May 10, noon.....	Constrn. concrete bridge.....	Stanley Struble, Comm.
Pennsylvania.	Washington.....	May 15, noon.....	Constrn. 3 bridges.....	J. H. Moffitt, County Compt.
Illinois.....	Mascoutah.....	May 16, 10.30 a.m..	Constrn. reinforced concrete superstructire.....	G. H. Liebig, City Clk.
Ohio.....	Youngstown.....	May 16, 11 a.m.....	Constrn. abutments of bridge, cleaning and painting.....	L. M. Hogg, County Aud.
Tennessee....	Chattanooga.....	May 27.....	Constrn. steel viaduct.....	Robt. Hooke, City Engr.
MISCELLANEOUS				
New York....	Poughkeepsie....	May 6, 3 p.m.....	Bldg. hose-drying building.....	J. J. Graham, City Chamberlain.
Cuba.....	**Santiago.....**	**May 6.....**	**Constrn. 6,400 meters of tramway.....**	**La Jefatura del Distrito de Oriente.**
New York....	Rochester.....	May 6, noon.....	Imp. playgrounds.....	J. S. Mullan, Sec'y Bd. Education.
New Jersey...	Linden.....	May 6, 8 p.m.....	Constrn. 600 ft. retaining wall.....	G. S. Everett, Township Clk.
Massachusetts.	Boston.....	May 7, noon.....	Constrn. 1,900 ft. subway.....	Boston Transit Comm.
Florida.....	Pensacola.....	May 7, 7 p.m.....	Completing county jail.....	County Comm.
Florida.....	Clearwater.....	May 7, noon.....	Constrn. county court house and jail.....	C. W. Wiecking, Clk. of Bd.
New Jersey...	Garwood.....	May 7.....	Furn. fire alarm system.....	Boro. Council.
Califo nia....	San Francisco...	May 8, 2.30 p.m....	Furn. & deliver. 48 double end pay-as-you-enter California type motor cars & 4 extra trucks complete with axles, wheels and motors.....	Board Public Works.
Florida.....	Jacksonville.....	May 8, 10 a.m.....	Furn. 7-ton tandem road roller.....	County Commissioners.
Massachusetts.	New Bedford....	May 8, 5 p.m.....	Furn. six 6-yd. end-dumping ash wagons.....	C. F. Lawton, Supt. of Streets.
Canada.....	Ft. William, Ont.	May 15.....	Install. 50-ton incinerating plant.....	John Wilson, City Engr.
Minnesota....	Lesueur Center.	May 20, 10 a.m....	Bldg. fireproof jail and residence.....	J. H. Kaisersall, County Aud.
Dist. Columbia	Washington.....	May 21.....	Furn. tandem steam road roller; also 10,000 ft. air hose....	Navy Department.
Indiana.....	Brazil.....	June 4.....	Constrn. court house, including heating plant.....	E. A. Staggs, County Aud.
Texas.....	Dallas.....	July 15, 2 p.m.....	Constrn. city hall; cost, $400,000.....	City Commissioners.
Wisconsin....	Appleton.....	May 17.....	Constrn. concrete retaining wall.....	E. L. Williams, City Clk.

STREET IMPROVEMENTS

Selma, Ala.—Petitions are being circulated asking for issue of $100,000 to $150,000 additional county road bonds.

Los Angeles, Cal.—Plans are being made for improvement of Wilmington and San Pedro rds.

Boulder, Col.—It has been decided at meeting of members of City Council and well known property owners to create paving district of 45 blocks in business section of town. District is as follows: Walnut st., from 11th to 16th; Pearl, from 10th to 18th; Spruce, from 10th to 16th; 10th, from Pearl to Spruce; 11th, from the railroad to Spruce; 12th, from the creek to Portland pl.; 13th, 14th, 15th and 16th, from the railroad to the alley between Spruce and Pine; 17th and 18th, from Pearl st. to the alley on either side.

Los Angeles, Cal.—Board of Public Works has ordered opening of Hoover st., making it 80 ft. wide, from Santa Barbara to Manchester ave.

Hartford, Conn.—Paving of Grove and Front sts. will be considered.

Middletown, Conn.—Improvements of streets is being considered.

Norwich, Conn.—Citizens will decide in June on kind of paving for Franklin and Washington sts.

Wilmington, Del.—Ordinance providing for bond issue of $100,000 to use in widening and curbing of streets and sewer improvements has been introduced in City Council and after receiving two readings has been referred to the Finance and Law Committees. Part of money provided by loan will be devoted to payment of widening 11th st., from Orange to Market sts., $50,000.

Washington, D. C.—Tenders will be opened on May 14 at offices of Chemin de Fer l'Etat Roumain, Bucharest, for construction of permanent way for line to be built from Zimnicea to Zimnicea Harbor. The upset price is put at about $195,000. Although this contract will probably be awarded to Roumanian firm, carrying out of work may involve purchase of materials out of country. Bureau of Manufactures No. 8604.

Jacksonville, Fla. — Bill has been passed requiring Committee on Public Works to grade and pave Jefferson st., from Bay st. to McCoy's Creek, with vitrified blocks; also to grade and pave Broad st., from Ashley to State st., with vitrified blocks.

Lakeland, Fla. — Consulting Engineer J. N. Hazlehurst has about completed surveys of street for paving and sewerage. It is expected that work will be commenced on all contracts within 30 days.

Orlando, Fla.—E. F. Sperry is circulating petition to County Commissioners asking them to open new road around Lake Ivanhoe.

Tampa, Fla.—Special committee appointed some time ago by City Council to prepare details of proposed bond issue for public improvements for Tampa has completed plans for larger appropriations, and is now at work on details of expenditures of about $100,000 for minor features of general plan of improvements. An effort is being made to have plans of committee concluded in time to submit bonding issue to people in general election to be held June 4, to eliminate calling of special election to vote on bond issue. Tentative plans call for expenditure of $700,000 for paving, this item really covering expenditure of about $1,400,000, as city only pays about half the cost.

Macon, Ga.—City Council has authorized paving of Pine and Third sts. in business sections.

Milledgeville, Ga. — Extensive street improvements have been planned.

Elkhart, Ind.—Paving of Garfield and Park aves., Cassopolis and S. Third sts., has been ordered.

Evansville, Ind.—At meeting of Board of Public Works resolutions for paving of Iowa st., from Edgar to Garvin sts., and for paving Mulberry st., between Evans and Willard aves., were confirmed. Clerk was instructed to advertise for bids and contractors wishing to enter bids will be given hearing April 27.

Fort Wayne, Ind.—Widening of Packard ave. and grading of St. Clair st. has been decided.

Indianapolis, Ind.—At conference between Board of Public Works and Board of Park Commissioners, it was decided former Board shall proceed with widening of 38th st., known as Maple rd., from Capitol ave. to fair ground. Plan is to widen street 40 ft., to make it 100 ft. wide, after which Park Board will undertake permanent improvement of street as boulevard. Cost of widening street will be about $100,000.

Indianapolis, Ind. — Resolutions have been adopted for improving of Madison, Oakland and Speedway aves. and Gravel rd.

Indianapolis, Ind.—Plans have been adopted for paving East New York st. with creosoted block at cost of $63,862; also Dearborn st., same material; cost, $26,083.

Marion, Ind.—Petition for improvement of Meridian st., from 15th to 38th sts. under provisions of three-mile gravel road law will be presented to County Commissioners in May, and Council was asked to adopt resolution granting to Commissioners privilege of improving road with covering of tarvia, under this law.

Muncie, Ind.—County Commissioners are discussing with Madison County Commissioners improvement of roadway between counties.

Muncie, Ind.—It is likely that Medal block brick will be used in paving streets to be improved this summer.

Richmond, Ind.—Plans have been completed by City Engineer Fred Charles for boulevard from National rd. to South E st. along west river bank.

Clinton, Ia.—From action taken by City Council it appears that Fifth ave., from Second to Fifth sts., will be paved this year. Proposed resolution on Fifth ave. paving acted upon recently gives some interesting information. Paving from line 15 ft. west of west line of Second st. to line 20 ft. west of east line of Third st. shall be 72 ft. between curbs, according to proposed resolution. Paving from line 20 ft. west of east line of Third st. to west line of Fifth st. shall be 50 ft. between curbs. Council proposes to advertise for bids for four different kinds of paving material, one of which will be selected. Bids will be asked upon following: Vitrified block paving, creosoted wood block paving, sheet asphalt and vitrified block paving and concrete paving.

Creston, Ia.—City will pave Washington st., from 17th to 18th sts.; 18th st., from Washington to State sts., and State st., from 18th to west line of 22d st. Work will consist of 12,300 sq. yds. paving and 7,450 ft. of curbing. T. S. De Lay, Engineer.

Leavenworth, Kan.—Following resolutions have been placed upon first reading: To grade and curb Prospect st., from Fifth ave. to Sixth ave.; to pave with brick Seneca st., from Fifth st. to Broadway.

Marion, Kan.—City Commission has engaged H. A. Rowland, McPherson, to make plans and specifications for about 15,000 yds. of paving. H. A. Rowland, County Surveyor and Engineer.

McPherson, Kan. — City Council has passed resolutions for paving about 10 blocks. H. A. Rowland, County Surveyor and Engineer.

Pittsburg, Kan.—Board of Commissioners have rejected all bids received for about 4,500 sq. yds. of brick pavement on 5-in. concrete base with asphalt filler, including sub-grading. Bids will be received again on same work. L. E. Curfman, City Engineer.

Lexington, Ky. — Joint Improvement Committee of General Council has recommended ordinances ordering improvement of following streets: East Main, from Walton ave. to Mentelle Park; East Third, from North Broadway to Walton

ave.; West Fourth, from North Broadway to the Newtown pike; Bolivar, from South Broadway to South Upper; Barr, from Walnut to North Limestone; Church, from North Broadway to North Limestone; Bryan ave., from East Main to Central ave.; South Upper, from West High to Bolivar; South Mill, from West High to Bolivar; Market, from Church to West Third; North Mill, from Church to West Third.

Louisville, Ky. — Board of Public Safety opened bids this afternoon for granite bloc.. paving in Fulton st., between Mill and Cabel sts. Only two bids were received, G. W. Gosnell & Co., bidding $3.55 a sq. yd., and Henry Bickel Co. bidding $3.48. As these bids were 43 cts. higher per sq. yd. than those for adjoining property they probably will be rejected and work again advertised.

Paris, Ky.—City is contemplating paving of various streets.

Bangor, Me.—Construction and repairs to streets are being discussed.

Boston, Mass.—Proposition has been approved for widening of Pleasant st. to agree with Broadway extension, and also to change name to Broadway.

Gloucester, Mass.—It has been decided to purchase road roller, and order making appropriation for same has been introduced and carried.

Haverhill, Mass.—Alderman Wood has made requisition for carload of liquid binder and 10,000 gal. of road oil.

Haverhill, Mass.—Appropriation will be asked for street work.

Lawrence, Mass.—Petitions have been granted for construction of sidewalks in various streets.

Lawrence, Mass.—County Board is considering improvements to various streets.

Malden, Mass.—It has been ordered that $12,500 be borrowed and expended as follows: $5,000 for street paving and $7,500 for sidewalks and edgestones.

Northampton, Mass. — Immediate improvement of Mt. Tom rd. is being considered.

Flint, Mich.—County Road Commissioners have begun active preparations for busy season in building of permanent highways under bonding plan which was approved by electors on April 1. Preliminary work of surveying is now well under way, with 10 miles surveyed on the Fenton and Corunna rds. and in Montrose Township. Surveyors will start on Saginaw rd., working northward from Mount Morris to Saginaw county line. An improved highway will be built from Flint to Saginaw, with exception of stretch of about a mile at north end of city, which it is up to Council to put in shape this summer. It is hoped to have at least 50 of the 231 miles of projected road new highway surveyed by May 1, when construction work will be commenced. A committee of Supervisors has advertised for bids for sale of the first $100.000 of total good roads bond issue of $500,000.

Lakefield, Mich.—Township will have special election May 20, at which time bonding proposition for $12,000 to be expended for good roads will be submitted. It is proposed by Superintendent Price and many other farmers in that section to construct stone road from north town line of Lakefield south to center line road, distance of five miles.

Alice, Minn.—Council has begun campaign of street improvements, and First ave. will be graveled its entire length.

Hibbing, Minn.—Village Council has directed Engineer Wilson, of Duluth, to prepare plans and specifications for three miles of creosote block pavement on these streets: Second and Third aves., from North st. to Missabe Railroad tracks; Pine st., from First to Fourth; Center st., from Third to Fourth, and Cedar st., from Second to Third aves.

Biloxi, Miss.—Widening and straightening of various streets have been planned.

Canton, Miss.—Bonds in sum of $50,000 will be sold in May for road improvements.

Yazoo City, Miss.—Bond issue of $75,000 has been authorized for road improvements.

Carthage, Mo.—Paving of Fourth st., from Lyon st. to Howard st., is contemplated.

St. Joseph, Mo.—Ordinance will shortly be introduced providing for improving of 24th st.

St. Joseph, Mo.—Ordinances have been passed providing for paving and grading of various city streets. J. E. Gates is City Clerk.

Atlantic City, N. J.—Ordinance has been passed providing for pavement of Baltic ave.

Camden, N. J.—Bonds in sum of $60,000 for street improvements have been awarded to Spitzer & Rorick.

Cranford, N. J.—Petition containing 24 names of property owners has been presented to Township Committee for widening of Claremont pl., from Union ave. to Prospect st., so that street will be 60 ft. in width.

Cranford, N. J.—Committee has decided to have gutters and curbing laid on North ave. on both sides of street from Central Railroad station to Rahway River.

Elizabeth, N. J.—City Council has authorized improvement of following streets as follows Chilton st., from Rahway ave. to West Jersey st., to be paved with brick pavement, on 6-in. concrete foundation; Grove st., from Westfield ave. to West Grand st., to be paved with brick pavement, on concrete foundation; Grove st., from Linden ave. to Murray st., to be paved with brick pavement, on concrete foundation. W. P. Neafsey, Street Commissioner.

Garwood, N. J.—Garwood Borough Council has decided to join with Cranford in macadamizing of Lincoln ave., from Central Railroad to North ave. Council has ordered new sidewalks laid in following locations: Both sides of Third ave., on south side of Second ave., in Cedar st. and in Myrtle ave.

Paterson, N. J. — The Manchester Bridge and Culvert Committee was authorized to solicit bids for new culvert on Manchester ave., North Haledon.

Paterson, N. J.—Resolution has been introduced by Freeholder MacDonald providing that Road Committee be authorized to advertise for bids for road repair work that is to be done this season.

Sea Island City, N. J.—Council will pave Landis ave. at expense of $20,000.

Carrizozo, N. M.—Citizens are in favor of $30,000 bond issue for good roads.

Albany, N. Y.—Highway Commission has awarded large percentage of contracts for bids on first section of their first big letting this season. Other awards will follow shortly, and Commission will advertise for second section of approximately 500 miles, which will be in about three weeks. Plans, maps and specifications for immense mileage to be put under construction this season are being rushed by Highway Engineers.

Central Bridge, N. Y.—State Road Surveyors have been through old Central Bridge Village preparing for macadamized road to be built this summer.

Mayville, N. Y.—Chatauqua County Board has arranged paving schedule as far ahead as 1915. Brick will be used on all highways.

Newburgh, N. Y.—Resolution has been approved by Mayor Corwin appropriating sum of $5,250 for purchase of 3,000 cu. yds. of crushed stone for repairing of Carpenter ave. and Farrington st.

Newburgh, N. Y.—Resolutions have been approved of by Mayor Corwin directing City Engineer to prepare estimates of cost of permanently improving Broadway, from Mill st. to West st., by paving full width, and directing City Clerk to advertise for bids for resurfacing with bitulithic pavement macadam roadway of Broadway, between Liberty and Mill sts.

Rochester, N. Y.—Improvement of Woodman and Wisner rds. in Irondequoit is being discussed.

Seneca Falls, N. Y. — Arrangements have been completed by Good Roads Committee of Board of Supervisors for construction of State highway, from southern terminus of Waterloo stone road toward Romulus. Contract will shortly be advertised.

Seneca Falls, N. Y.—Village Trustees are arranging with Street Department for adequate street cleaning machinery and equipment, and are planning system whereby every pavement can be cleaned at least once a day.

Fargo, N. Dak.—Question of paving alleys in business part of city is being discussed.

Dayton, O.—Councilman Geisler has introduced resolution to pave Lorain st., from Nassau to Linden.

Eaton, O.—State aid will be given to construct five miles macadam and rebuild two miles.

Hamilton, O. — Following resolutions have been passed: Declaring it necessary to construct cement sidewalks on north side of Dayton, between Ninth and 10th sts.; to curb and gutter on south side of Millikin ave., from Ludlow to Woodlawn ave.; curbs and gutters both sides of 12th, between Ludlow and Maple ave.; curbs and gutters on 13th, from Hanover to the south line of Doddsworth Addition and for curbing and guttering on both sides of Ninth, between Hanover st. and Edison ave.

Salem, O. — Resolutions have been adopted for laying of sidewalks in various streets.

Springfield, O.—Petition will be presented at next meeting of Council, asking for improvement of West Washington st., Thompson ave. and Severs st. by installation of gas, water and sidewalks, curbs and gutters, also that above named streets be paved.

Youngstown, O.—Resolutions have been adopted as follows: Extending Fairmont ave.; extending Fulton st. to South ave.; grading Wellington ave., from Salt Spring rd. to Steel st.; extending Marble st. to Texas alley; paving Inglis st., from Edwards st. to Hillman st.

Youngstown, O.—Ordinance has been passed for issuance of $1,500 in bonds for street improvements.

Zanesville, O.—It is proposed to lay about 50,000 sq. yds. brick paving, to cost about $75,000.

Chester, Pa.—Paving of Edgmont ave. is being discussed.

Elizabethville, Pa.—Borough Council is asking Dauphin County Court for authority to proceed with widening of Vine st. in accordance with ordinance passed two years ago. Arch st. is also to be extended.

Johnstown, Pa.—Sidewalks and curbing will be laid along Ferndale ave., Ferndale.

Shamokin, Pa.—State Engineer Arthur S. Clay, of Bloomsburg, says that proposed State highway between Shamokin and Mt. Carmel will be one of first of 14 to be built this year. That between Shamokin and Sunbury will follow soon after. Roads will either be of brick, high grade macadam or asphalt. When completed there will be complete stretch of fine State highway between Pottsville and Sunbury.

Sharon, Pa.—State Highway Department is now advertising for bids to improve various roads of State which are to be completed this year under the Sproul bill and stretch between Sharpsville and Sharon is among those named. This road is known as Section 3 of Route 238, Hickory Township.

York, Pa.—Common Council bill authorizing repair of Union alley, from Newberry st. to Garfield school building, has been passed finally; also bill authorizing grading and repairing of East Philadelphia st., from Hartman st. to Harrison st.

Castlewood, S. Dak.—Committee and members of Board of County Commissioners will inspect proposed route of Meridian rd. and plan for its construction. When road is completed lateral roads running from each town will be built to it. In addition to building Meridian rd. committee will interest themselves in construction of good roads in all portions of Hamlin County.

Highmore, S. Dak.—County Commissioners of Hyde County are doing their share toward building up and improving Black Hills-Yellowstone-Park-to-Coast-Highway, by working upon same. They have advertised for bids and will let contract to grade four miles of road directly west of Highmore.

Sioux Falls, S. Dax.—Col. T. H. Brown, J. M. Freese and Arthur Koenig have been appointed a committee to report on suitable pavement for Phillips ave.

Sioux Falls, S. Dak.—Specifications, prepared by City Engineer for paving of Sixth st., from Nesmith ave. to Sioux River, have been adopted; also resolution to pave Sixth st. with jasper blocks, from Nesmith ave. to Sioux River.

Knoxville, Tenn.—Repairing of Dale ave. to Ninth st. is being discussed.

Nashville, Tenn.—Bill has passed second reading appropriating $2,200 for purchase of two street flushing machines.

Nashville, Tenn. — Seventh ave., between Church and Broadway, will shortly be widened 10 ft.

Dallas, Tex.—Estimates for paving Colonial ave. have been submitted to Street Commissioner Lee by City Engineer Preston, showing amount of grading, paving, curbing and guttering necessary to establish 40-ft. roadway 4,223 ft. in length. Estimates of paving were made in response to petition from residents of Colonial ave. Commissioner Lee will report to Commission soon as to advisability of paving street at present and then, if work is to be done, bids will be advertised for and contracts awarded.

Victoria, Tex.—County Commissioners' Court has opened bids of 12 contractors for road building in this Commissioners' precinct, under recent $200,000 bond issue. All bids were rejected except those of Texas Building Co., of Fort Worth, and James Kelso, of Galveston, and consideration of them was postponed for few

days, when one or the other will be accepted or both rejected and new bids called for.

Ogden, Utah—Commission has ordered opening of 29th st., between Washington and Pacific aves.

Chatham, Va.—Bonds in sum of $20,000 have been voted for paving Main st.

Harrisonburg, Va.—Board of Supervisors are making preliminary arrangements for issuance of $30,000 worth of bonds to build Broadway-Mathias rd.

Norfolk, Va.—Appropriation of $1,700, one-half estimated cost of paving Archer's Lane near Union Station, has been recommended by Public Improvement Committee of City Council. Norfolk Terminal Co., owner of Union Station, will pay other half.

Norfolk, Va.—Mayor Riddick has signed ordinances providing heavy bond issues for permanent improvements in Ninth and 10th Wards. Amount of appropriation for Ninth Ward is $248,000 and for 10th it is $214,000, making total of $562,000, for all of which city bonds will be issued.

Stafford, Va.—Stafford County has voted $100,000 bond issue for macadamizing or otherwise improving public roads.

Seattle, Wash.—Plans have been approved for grading of East 17th st.; estimated cost, $12,250; also grading for alley block 17. J. J. McGilvra's second addition; estimated cost, $3,300.

Tacoma, Wash.—Preliminary resolution providing for paving of Union ave., from its intersection with flume line near South 38th st., south to city limits, has been adopted by Municipal Commission. Total cost of improvement will be $100,000. Of this amount city and county together will pay about $60,000. Another hard surface pavement to south probably will be constructed soon, and likely on Pacific ave., as it is most direct route to Mount Tacoma.

Benwood, W. Va.—Petition has been presented from number of Union district taxpayers, asking County Court to submit to legal voters of district $150,000 bond issue, money to be used for paving several of main thoroughfares. Petition also asks for Court to appropriate $20,000 from county fund to be used on Union district roads.

Wheeling, W. Va.—County Court has granted petition for vote on issue of $150,000 road bonds.

Ashland, Wis.—Bayfield County Board has voted to issue $40,000 for roads and $10,000 for steel bridge.

Green Bay, Wis.—Council is considering paving of various streets. It has been decided to use asphaltic concrete on some streets, and sheet asphalt on Main ave.

Superior, Wis.—It has been decided to pave Tower ave. New paving will be of permanent character, having concrete base. Wearing surface will be of asphalt, brick, creosoted blocks or bitulithic macadam as property owners desire.

CONTRACTS AWARDED

Helena, Ark.—To Southern Bitulithic Co., for paving Walnut St. Paving District, for $35,000.

Little Rock, Ark.—By Commissioners of Street Improvement District No. 192, to I. P. Shelby, of Little Rock, to pave W. Seventh st., from Center to Victory st., with wood blocks.

South Pasadena, Cal.—To Andrew Holloway, 16 S. Raymond ave., for improvement of Huntington Drive, for $75,670. Other bidders were: Montgomery & Marsh, $77,440; Barber Asphalt Paving Co., $79,598.

Hartford, Conn.—By City, for various improvements, as follows: For cement walks, to Nicola Bellini, at following prices: Walks, 12½ cts. per sq. ft.; curbs, at 34 cts. per lin. ft. For street sprinkling by carts, to H. R. Walker Co., at 1 3-10 cts. per running ft.; contractor to furnish carts, the city the water. Right to discontinue sprinkling after 15 days' notice was included. For street sprinkling by cars, to American Car Sprinkler Co., from April 18 to Nov. 15, for $2,800. For relaying flag walks and curbs, to M. W. Halloran and T. C. Smith separately, work to be equally divided. Prices of walks, 3 cts. per sq. ft.; resetting curb, 15 cts. per sq. ft. They were also awarded contracts for laying new flag walks at 23 cts. per sq. ft.; curbs, at 65 cts. per lineal ft. M. W. Halloran and T. C. Smith were awarded contracts for laying stone crosswalks, at $1 per lineal ft. for bluestone, and $1.25 for granite.

Augusta, Ga.—By City, for laying sidewalks, to W. E. Bowe, at 9.2 cts. per sq. ft. and 12 cts. for driveways; for curbing, to Lewis & Stafford, at 36 cts. for straight curbing and 43 cts. for curved.

Bement, Ill.—For paving Bodman st., to Wm. F. & James Lodge, for $16,633.

Moline, Ill.—For constructing 2,490 sq. yds. of asphalt pavement, and 1,904 lin. ft. of curb and gutter, on 12th st., from 17 to 19th aves., by Board of Local Improvements, to Barber Asphalt Paving Co., 143 Dearborn st., Chicago, Ill., at $6,700. Lyle Payton is City Engineer.

Moline, Ill.—For paving 24,825 sq. yds. of asphalt and 23,182 lin. ft. of curb and gutter, by Board of Local Improvements, to McCarthy Improvement Co., Davenport, Ia., at $65,000.

Peoria, Ill.—For paving Knoxville ave., from Illinois st. to city limits, with brick, by City Council, to A. D. Thompson, Y. M. C. A. Bldg., at $33,500. L. D. Jeffries is City Engineer.

Logansport, Ind.—By Board of Commissioners of Cass County, for road work, as follows: Crane rd. No. 1, Hyman & Novinger, Logansport; Crane rd. No. 2, Martin McHale, Logansport; concrete work, F. T. Woods, Burnettsville, Ind., and Walter Girton, Logansport.

Washington, Ind.—By Board of Commissioners of Daviess County, for construction of gravel roads, to Albert Muschewan, Washington; Anthony Englehart, Plainville, Ind., and Ore McKitrick, Plainville.

Charles City, Ia.—By City Council, to Bryant Asphalt Co., Waterloo, at $1.85 per sq. yd., for constructing 33,000 sq. yds. of asphalt paving on Main st., from Court House Hill to South st.

Newton, Ia.—For 40,000 sq. yds. brick paving, to G. Manicini Co., of Florence, at $1.18 per sq. yd.

Sioux City, Ia.—By City Council for street improvements, to M. L. Flinn Paving Co., P. C. Hansen & Son, E. J Hanlon and Jesem & Krage.

Webster City, Ia.—By City Council, for paving and guttering various streets in city, to Sullivan & Zitterell, at $1.39 per sq. yd., for asp alt pavement and 44½ cts. for curbing. C. H. Currie is City Engineer.

Leavenworth, Kan.—For paving Michigan ave., from Broadway to Ninth ave., to O. C. Chapin. His bid was $4,016.94. McGuire & Stanton, Thomas F. Jones and Fred Tarry & Son also bid.

Louisville, Ky.—Sidewalk contracts have been awarded to American Concrete Construction Co. and Edwin S. Larson. Paving contract to G. M. Gosnell Co.

Augusta, Me.—For building one-mile earth and gravel road between Webbs Mills and Poland Springs, by State Highway Commissioner, to David McLellan, of Webbs Mills, at bid of $1,174.73. This piece of road is in the town of Casco and its construction has received support in contributions from Rickers as well as State and town.

Biddeford, Me.—For building earth and gravel State road, between Webbs Mills and Poland Spring, in town of Casco, to David McLellan, of Webbs Mills, for $1,174.73.

Baltimore, Md.—By Board of Awards, to Cunningham Paving & Construction Co., 1345 Arch st., Philadelphia, at $35,997.60, for vitrified block contract No. 17, and to Consolidated Engineering Co., Emerson Tower Bldg., Baltimore, at $2,412, for vitrified block contract No. 19. Charles A. Edel, Secretary of Paving Commission.

Ivanhoe, Minn.—By County Board of Lincoln County, for road improvements, as follows: Road No. 6, Nels Utoflar, Tyler, Minn.; road No. 9, Henry Enke, Lake Benton, Minn.; road No. 9, Carl Ingvolson, Ivanhoe.

Minneapolis, Minn.—For macadamizing Road No. 13, to G. A. Furnham, of Long Lake, and J. J. Mergens, of Deephaven, for $23,700.

Jackson, Miss.—To Gano & Wilson, of Jackson, to construct 17 miles of road.

Chillicothe, Mo.—By City Council, for four sidewalk districts, as follows: J. F. Meek, Jr., First Sidewalk District, at 12.5 cts. per sq. ft.; E. M. Baker, Second Sidewalk District, at 12.6 cts. per sq. ft.; John Provolt, Third Sidewalk District, at 12.5 cts. per sq. ft.; Charles Dayton, Fourth Sidewalk District, at 12.6 cts. per sq. ft.

Lexington, Mo.—By Board of Commissioners of Lexington Special Road District of Lafayette County, for road work as follows: 2½ miles rock road, S. A. Walker, Lexington; 6½ miles grading, J. R. Clark, Buckner, Mo.

Helena, Mont.—By City, as follows: District No. 50, to Adam Bros., 6,100 cu. yds. fill, 50 cts.; 1,100 cu. yds. loam, $1.25; 44,200 sq. ft. concrete walks, 14 cts.; 7,260 lin. ft. concrete curb, 40 cts.; 1,240 lin. ft. concrete crosswalks, $1; 5,700 lin. ft. old walk removed, 1 ct.; 66 single-light electric lamp posts with wiring and shade, each $34.75; 7,400 lin. ft. fibre conduit set in curb, 9½ cts.; 7,400 lin. ft. of D. B. cambric ins. No. 6 copper conductor, 9 cts.; 24 double-water connections, $20; 32,000 sq. yds. rolling street, 1 ct.; 290 lin. ft. circular granite curb set, $1.50; total, $20,272. District No. 53, to the Miracle Tripp Concrete Co., 8,306 cu. yds. fill, 40 cts.; 1,136 cu. yds. loam, $1; 42,200 sq. ft. concrete walks, 14½ cts.; 7,250 lin. ft. concrete curbs, 45 cts.; 1,112 lin. ft. concrete crosswalks, $1; 61 single-light electric lamp posts with wiring and shade, each $40; 7,200 lin. ft. of D. B. cambric ins. No. 6 copper conductor, 18 cts.; 7,200 lin. ft. fibre conduit, 12½ cts.; 23 double-water connections, each $25; 28,000 sq. yds. rolling street, ½ ct.; total, $20,811.

Cranford, N. J.—By City, for macadamizing Union ave., from Chester pl. to Lenox ave., to J. C. Park, for sum of $922.

Elizabeth, N. J.—For paving of Cherry st., to Edward L. Faughnan. Asphalt macadam will be used, which is same material as was laid in North ave., from North Broad st. to Newark ave. Cost is $7,587.

Paterson, N. J.—To De Vogel Contracting Co., for reinforced concrete culvert on Athenia blvd., at $1,060.

Sea Bright, N. J.—By Board of Freeholders, for paving 1⅔ miles of State boulevard, between Sea Bright and Highlands, to Richard R. Hughes, of West Long Branch, for $9,951.

Albany, N. Y.—By State Commission of Highways, for improvement of highways for which proposals were received on April 15, 17, 19, as follows: Road 351, Ulster County, to DeGraff & Hogeboom, Kingston, $70,932. Road 352, Ulster County, Mallock & Angle, Newburgh, $19,965. Road No. 467, Herkimer County, Newport Construction Co., Newport, $74,827. Road 493-A, Monroe County, Monroe Roads Co., Pittsford, ford, $9,674. Road 574, Monroe County, Julius Friedrich Co., Rochester, $199,159. Road 575, Monroe County, Monroe Roads Co., Pittsford, $41,811. Road 588, Harradine Bros., Spencerport, $18,633. Road 633, Monroe County, Wood & Tompkins, Hilton, $42,594. Road 668, Chenango County, Newport Construction Co., Newport, $13,231. Road 765, Rensselaer County, Wm. Patterson, Albany, $33,362. Road 803, Washington County, James Anderson, Albany, $63,011. Road 945, Allegany County, P. H. Murray, Rochester, $42,787. Road 949, Rensselaer County, County Construction Co., Troy, $4,083. Road 950, Greene County, Catskill Supply Co., Catskill, $5,197. Road 955, Madison County (no award, above engineer's estimate). Road 960, Cattaraugus County, F. L. Cohen, Buffalo, $37,353. Road 966, Lawrence County, Burns Bros & Haley, Watertown, $35,802. Road 967, Lawrence County, Spellman-Oliver Co., Chateaugay, $29,961. Road 972, Oswego County, Thomas Grady, Rochester, $49,064. Road 975, Wyoming County, Greenfield Construction Co., Hornell, $23,189. Road 977, Albany County, John B. Dower, Ballston Spa., $61,125. Road 978, Albany County, Ruddy & Saunders Construction Co., Troy, $41,214. Road 979, Albany County, Herlihy Contracting Co., Glens Falls, $81,406. Road 980, Rensselaer County, Corliss Construction Co., Troy, $26,720. Road 981, Rensselaer County, Arnold & Shearer, Albany, $34,471. Road 983, Delaware County, John H. Gordon, Albany, $20,324. Road 988, Nassau County, Wm. P. McDonald Construction Co., Mt. Vernon, $4,905. Road 989, Erie County, Thos. Fitzgerald Co., Fredonia, $77,251. Road 990, Erie County, Hurley & Lyne, Fredonia, $33,953. Road 991, Erie County, Louis H. Gipp, Buffalo, $58,800. Road 992, Wayne County, Geo. W. Chambers, Rochester, $22,492. Road 993, Wayne County, Monroe Roads Co., Pittsford, $10,179. Road 994, Wayne County, Greece Construction Co., Rochester, $39,106. Road 995, Cortland County, Rifton & Murphy, Rochester, $47,535. Road 996, Cortland County, M. D. Windsor, Guilford, $20,608. Road 998, Greene County, S. B. Van Wagenen, Rondout, $74,555. Road 999, Schuyler County, Coughlin & Lowman, Watkins, $65,562. Road 1000, Steuben County, P. F. Connolly, Boston, Mass., $60,452. Road 1001, Tompkins County, Patrick Conley, Ithaca, $57,337. Road 1002, Tompkins County, Whalen & Gailer, Whitehall, $29,842. Road 1007, Dutchess County, Lane Construction Co., Meriden, Conn., $24,743. Road 1008, Clinton County, Spellman-Oliver Co., Chateaugay, $15,498. Road 1010, Livingston County, Hagaman & White, Rochester, $12,988. Road 1011, Chautauqua County, Kerwin Construction Co., Albany, $65,380. Road 1012, Chautauqua County, Kerwin Construction Co., Al-

bany, $48,939. Road 1013, Chenango County, Erwin D. Baker, Binghamton, $3,143. Road 1014, Chenango County, John H. Gordon, Albany, $1,403. Road 1016, Cayuga County, Dollard & Heeran, Albany, $108,184. Road 1018, Suffolk County, Suffolk Contracting Co., Huntington, $73,335. Road 5091, Oneida County, Warren Bros Co., Boston, Mass., $38,204. Road 5131, Oneida County, Warren Bros. Co., Boston, Mass., $44,631. Road 5161, Herkimer County, Warren Bros. Co., Boston, Mass., $74,445. Road 5163, Rensselaer County, County Construction Co., Troy, $5,606. Road 5166, Greene County, Rousseau & Parker, Hudson, $46,522. Road 5170, Herkimer County, Warren Bros., Co., Boston, Mass., $66,556. Road 5172, Erie County, Erie Contracting Co., Buffalo, $64,992. Road 5175, Jefferson County, M. R. Klock & Co., Watertown, $7,261. Road 5176, Ulster and Orange Counties, Jova & Kehoe, Newburgh, $35,480. Road 5193, Erie County, Niagara Contracting Co., Buffalo, $63,709. Road 5201, Chautauqua County, Thos. Mahoney, Jamestown, $53,071. Road 5202, Otsego County, Hollington Co., Troy, $39,427. Road 5203, Putnam County, H. B. Sproul, Inc., Peekskill, $150,299. Road 5204, Steuben County, Atlanta Construction Co., Atlanta, $34,728. Road 5205, Saratoga County, W. G. Fox, Saratoga Spa, $60,538. Road 5206, Tompkins County, Dollard & Heeran, Albany, $38,838. Road 5208, Chemung and Schuyler Counties, McGreevey, McGuigan & Baum, Elmira, $86,174. Road 5209, Herkimer County, Henry W. Roberts & Co., Utica, $57,900. Road 5210. Orange County, Jackson Bros., Cuddebackville, $72,965. Road 5211, Steuben County, Shaughnessy Construction Co., Albany, $87,532. Road 5212, Steuben County, Greenfield Construction Co., Hornell, $38,140. Road 5213, Tompkins County, R. Hopkins, Troy, $54,892. Road 5214, Tompkins County, McGreevey, McGuigan & Baum, Elmira, $66,203. Road 5215, Tioga and Broome Counties, H. B. Sproul, Inc., Peekskill, $72,094. Road 5216, Chenango County, Newport Construction Co., Newport, $13,484. Road 5217, Chautauqua County, Erie Contracting Co., Buffalo, $156,313. Road 5219, Herkimer County, Alfred Musso, Frankfort, $98,040. Road 5220, Niagara County, Erie Contracting Co., Buffalo, $105,385. Road 5221, Oswego County, Semper Bros., Watertown, $57,922. Road 5222, Rensselaer County, Snead & Wilson, Brown Station, $68,799. Road 5223, Sullivan County, Merritt Construction Co., Tuckahoe, $124,849. Road 5224, Steuben County, Shaughnessy Construction Co., Albany, $71,709. Road 5225, Tompkins County, Wm. Hazzard, Trumansburgh, $13,328. Road 5226, Westchester County, Wm. P. McDonald Contracting Co., Mt. Vernon, $79,991. Road 5227, Warren County, Shaughnessy Construction Co., Albany, $55,665.

Newburgh, N. Y.—By City Council, for grading of Carter st., between Robinson ave. and Prospect st., to Jova & Kehoe. Specifications prepared by City Engineer called for 2,100 cu. yds. of earth excavation, 50 cu. yds. of rock excavation, and 200 cu. yds. of gravel top-dressing. Bids in detail were as follows: Louis Argenio, earth excavation, 65 cts.; rock excavation, $2.20; top-dressing, $1.25; total, $1,581. Hallock & Angle, earth excavation, 58 cts.; rock excavation, $2.25; top-dressing, $1.25; total, $1,581. Jova & Kehoe, earth excavation, 59 cts.; rock excavation, $2.50; top-dressing, $1; total, $1,564. Abner M. Harper, earth excavation, 69 cts.; rock excavation, $2.10; top-dressing, $1.20; total, $1,794.

Newport, N. Y.—To Newport Construction Co., for building Newport-Norway-Cold Brook rd.

Port Jervis, N. Y.—For construction of about 6½ miles of Middletown-Bloomingburgh rd. on Route 4, to Jackson Bros., of Cuddebackville, for $72,000. For construction of about two miles of concrete bituminous highway, to Hallock & Angle Co., of Newburgh, at $19,965 90. Road work to be done is on outskirts of Kingston, finishing up of highway between that city and Ellenville, Ulster County. Bid for De Graff & Hogeboom who were contractors building Port Jervis Cahoonzie State rd., was $19,960.28. Bids, however, were by units, and these bidders made mistake, and their error made Hallock & Angel Co. lowest bidders by about $200.

Seneca Falls, N. Y.—By Village, for sprinkling streets for six months, to Jas. Souban and R. Cappy, at $1,287.

Utica, N. Y.—For paving of Yorkville rd., to Warren Bros.

Charlotte, N. C.—Contracts for paving are reported awarded as follows (bids opened April 10) by City Executive Department: 71,248 sq. yds. bitulithic paving, to West Construction Co., for $120,409; 45,265 sq. yds. asphalt paving, to Southern Paving Co., of Chattanooga, Tenn., for $71,968, and 44,500 sq. yds. bituminous penetration work, to Atlantic Bitulithic Co., for $58,395.

Charlotte, N. C.—By City Council, to J. W. Haas, Charlotte, at $51,733, for construction of 34,000 sq. yds. of cement sidewalks. Joseph Firth is City Engineer.

Cambridge, O.—By Commissioners of Guernsey County, for grading and paving with brick Stubenville rd., Part No. 390, to Adams Bros. Contracting Co., of Zanesville, O., at $15,132.60. Length of road, 5,280 ft.; also to same firm, at $14,447, for grading and paving with brick Newcomerstown rd., length 5,280 ft.. J. R. Marker, State Highway Commissioner.

Delaware, O.—For grading, draining and macadamizing Culver Creek rd., 2.11 miles in length, to V. T. Barton, of Sunbury, O.

East Youngstown, O.—By Council, for laying sidewalks, to E. A. Grubb, at 10.7 cts. per ft. using limestone.

Elk, O.—By Commissioners of Vinton County, for grading and constructing with waterbound macadam McArthur-Hamden rd. in Elk and Clinton Townships, length 17,080 ft. or 3.24 miles, to Jardine, Brewer & Tonlinson, Chillicothe, O., at $22,389. James R. Marker, State Highway Commissioner.

Jefferson, O.—By City, for paving three streets, to Contractor George M. Harris.

Knox, O.—By Commissioners of Jefferson County, for grading and paving with waterbound macadam New Somerset rd., length 14.106 ft., or 2.67 miles, to McLaughlin, Rayl & McLaughlin, East Liverpool, at $28,160.51. James R. Marker, State Highway Commissioner.

McArthur, O.—To Jardine Brewer and Tom Linson, of Chillicothe, for building 3¼ miles of pike between McArthur and Hamden, at $22,389.

St. Bernard, O.—By Board of Public Service, for improving Beach st., including grading, macadamizing, curbing, etc., to I. J. McKim, Cincinnati, O., Builders' Exchange.

Steubenville, O.—By Board of County Commissioners, to McLaughlin, Rayl & McLaughlin, at $28,161, for construction of new Somerset macadam road.

York, Pa.—By Highway Committee of City Council, for various highway improvements, as follows: Bids for laying brick sidewalks were: General Supply & Construction Co., sidewalks, 7½ cts. per sq. ft.; gutters, 12 cts. per lineal ft. A. B. Kraft, sidewalks, 7 cts. per sq. ft.; gutters, 14 cts. per lineal ft. Contract was awarded to General Supply & Construction Co. Bids for laying cement sidewalks and curbs were: Hartley-Ziegler Co., sidewalks, 10 cts. per sq. ft.; curbs, 30 cts. per lineal ft.. A. B. Kraft, sidewalks, 10½ cts. per sq. ft.; curb, 28 cts. per lineal ft. General Supply & Construction Co., sidewalks, 10 cts. per sq. ft.; curb, 25 cts. per lineal ft. Contract was awarded to General Supply & Construction Co. General Supply & Construction Co. offered Belgian blocks of No. 1 quality at 10 cts. each. It was only bidder and received the contract. Only one bid for common brick was received, that of A. B. Kraft, at $8.25 per thousand and he was awarded contract. Bids for vitrified paving brick per thousand were: General Supply & Construction Co., $23; G. A. Barnitz, $21.80 and $18.80; A. B. Kraft, $24. Contract was awarded to G. A. Barnitz.

Providence, R. I.—By State Board of Public Roads, following contracts for construction of State roads: Gloucester (Putnam Pike), to B. Perini, at $41,800; Burrillville, to Amos D. Bridge Sons, Inc., $5,290; Johnson and Cranston, to Charles E. Home, at $15,982; South Kingston, to Bristow Bros., at $21,438; Exeter and Richmond, to E. J. Rourke, at $30,330; Coventry, to Bristow Bros., at $23,737; Warwick, to Bristow Bros., at $28,444, $15,326 and $16,729.

Knoxville, Tenn.—By Monroe County Road Commission, to R. L. Peters, a Knoxville contractor, for 160 miles of grading and necessary concrete bridge work for road system for that county. The work is to be paid for with bond issue of $300,000 recently ordered.

Knoxville, Tenn.—By Loudon County, to J. B. McTye & Son, Knoxville contractors, to improve 50 miles of roadway in that county at cost of $100,000. All roadway will be graded and 10 miles macadamized, latter to be part of Bristol-to-Memphis highway.

Nashville, Tenn.—By City, for supplying two street flushing machines, by Board of Public Works, to St. Louis St. Flushing Machine Co., at $839.75 apiece.

Lynchburg, Va.—By Council Committee on Streets, for rubble stone paving, sidewalks and sewers on 12th st., South Lynchburg and on White Rock Hill, to J. R. Ford Co. The action of the two branches of City Council will be necessary before committee can sign the contract work. There were five bids, all of bidders being local contractors, excepting A. C. Bedford, of Richmond. The bidders were: J. R. Ford Co., $91,591; Virginia Construction Co., $95,056; S. B. Bennington, $99,094; A. C. Bedford, $105,337. The estimate for the work, as made up by the Engineering Department, is $102,000.

Port Arthur, Ont.—By City Council, for paving Pearl, Bay and Algoma sts., to National Paving Co., of Winnipeg, Man., for about $80,000.

BIDS RECEIVED

Charlotte, N. C.—By City Executive Dept., for about 161,007 sq. yds. paving: (a) bitulithic, (b) sheet asphalt, (c) asphalt paint coat method, (d) bituminous macadam, mixing new stone, (e) bituminous macadam, old stone, (f) bituminous macadam, concrete base, (g) special bituminous macadam on concrete base, (h) bituminous macadam penetration, new stone, (i) bituminous macadam penetration, old stone, (j) bituminous macadam penetration on concrete, (k) double bond, (l) asphaltic concrete on concrete, (m) grading 42,341 cu. yds., (n) setting old curb, 21,411 ft., (o) setting new curb, (p) 18-in. concrete curb, 63,799 ft., (q) 6-in. tile per ft. Atlantic Bitulithic Co., Richmond, Va.—(a) $1.99, (d) $1.46, (e) $1.16, (f) $1.51, (g) $1.68, (h) $1.26, (i) 96 cts., (j) $1.31, (k) $1.48, (l) $1.48, (m) 39 cts., (n) 7 cts., (o) 7 cts., (p) 36 cts., (q) 15 cts. West Constr. Co., Chattanooga, Tenn. (two bids, first figure Bermuedez, second oils)—(a) $1.40 and $1.26, (b) $1.74 and $1.54, (c) $1.49 and $1.49, (e) $1.10 and $1, (f) $1.35 and $1.25, (g) $1.39 and $1.25, (k) $1.24 and $1.14, (l) $1.43 and $1.29, (m) 49 cts. and 49 cts., (n) 10 cts. and 10 cts., (o) 10 cts. and 10 cts., (p) 27 cts. and 27 cts., (q) 15 cts. and 15 cts. Kelley Bros., Portsmouth, O. (two bids, first figure Texaco-Cubanole, second Tarvia Standard)—(d) $1.27 and $1.25, (e) $1.15 and $1.13, (f) $1.46 and $1.44, (h) $1.25 and $1.23, (i) $1.13 and $1.11, (j) $1.44 and $1.42, (m) 54 cts. and 54 cts., (n) 7 cts. and 7 cts., (o) 15 cts. and 15 cts., (p) 36 cts. and 36 cts., (q) 20 cts. and 20 cts. Porter & Boyd, Charlotte, N. C.—(d) $1.30, (e) $1.20, (f) $1.45, (h) $1.15, (i) $1, (j) $1.35, (m) 55 cts., (n) 10 cts., (o) 10 cts., (p) 32 cts., (q) 15 cts. Warner-Quinlan Asphalt Co., Syracuse, N. Y. two bids, first figure Bermuedez, second Mexican)—(b) $1.79 and $1.74, (c) $1.67 and $1.64, (l) $1.59 and $1.54, (m) 50 cts. and 50 cts., (n) 30 cts. and 30 cts., (o) 30 cts. and 30 cts., (p) 30 cts. and 30 cts., (q) 25 cts. and 25 cts. Johnston, Porter & Peck, Charlotte, N. C.—(h) $1.25, (i) $1.05, (m) 40 cts., (n) 15 cts., (o) 15 cts. T. J. McGuire, Norfolk, Va.—(f) $1.48, (j) $1.33, (m) 45 cts. Southern Paving Construction Co., Chattanooga.—(b) $1.59, (c) $1.52, (m) 38 cts., (n) 12 cts. Bids were opened, same time and place, for sidewalks, as follows: (a) walk, 34,424 sq. ft.; (b) old curb reset, 21,411 lin. ft.; (c) curved curb, 1,167 lin. ft.; (d) concrete curb, 18-in., 50,299 lin. ft.; (e) concrete curb, 12-in., 13,500 lin. ft.; (f) total sidewalks only; (g) total walks and concrete curb, old curb not included; (h) total walks and all curbing: F. J. McGuire—(a) 97 cts., (b) 10 cts., (f) $33,391. Propst Contr. Co.—(a) 99.5 cts., (b) 10 cts., (c) 37.5 cts., (d) 32 cts., (f) $34,257, (g) $50,785, (h) $52,926. West Const. Co.—(a)$1.06, (b) 10 cts., (c) 44 cts., (d) 27 cts., (f) $36.489, (g) $53,554, (h) $52,724. Porter & Boyd—(a) $1.10, (b) 10 cts., (c) 40 cts., (d) 32 cts., (e) 28 cts., (f) $37,866, (g) $58,209, (h) $60,349. J. W. Haas—(a) 94.75 cts., (b) 8 cts., (c) 30 cts., (d) 28 cts., (e) 22 cts., (f) $32,617, (g) $50,021, (h) $51,733. S. Monroe Sons Co.—(a) $1,175, (b) 8 cts., (c) 45 cts., (d) 36 cts., (e) 31 cts., (f) $40,448, (g) $63.266, (h) $64,979.

Kenosha, Wis.—For paving (a) Fremont ave. and (b) Milwaukee ave.: N. F. Reichert, Racine, (a) brick, $20,704; (b) brick, $8,666. James Cope & Sons, Racine, (a) brick, $20,005; (b) $7,820. McCugo-Bullock Co., Waukegan, (a) brick, $19,616, (b) brick, $19,616. Christ. Peterson, Kenosha, (a) brick, $19,199; (a) asphalt, $19,756; (b) brick, $7,521. West Improvement Co., Racine, (a) asphalt, $18,867, and White Construction Co., Milwaukee, (a) asphalt, $17,895.

Waukesha, Wis.—For paving E. Main, Caroline, Pleasant, Martin, Barstow, Randall sts. and St. Paul ave.: G. H. Stanchfield, of Fond du Lac, $43,925; E. Bartlett, of Watertown, $44,243; Nelson-Weber Constr. Co., of Oconomowoc, $45,575; Ad-

vance Constr. Co., of Waukesha, $46,563; Jas. Cape & Sons, of Racine, $48,069; A. C. Blake, of Madison, $48,516, and Chris. Peterson, of Kenosha, $53,518.

SEWERAGE

San Francisco, Cal.—Sum of $20,000 has been recommended for reconstruction of Stonyan st. sewer.

Plainfield, Conn.—It is understood that modern sewer system is to be installed through mill villages at Plainfield, which are models of their kind.

Wilmington, Del.—Ordinance providing for bond issue of $100,000 to use in widening and curbing of streets and sewer improvements have been introduced in City Council. Part of money provided by loan will comprise special fund for Street and Sewer Department for use in extending present sewer system.

Fort Meade, Fla.—City has voted $20,000 for sewer system.

Lakeland, Fla.—Consulting Engineer J. N. Hazlehurst has about completed surveys of streets for sewerage. It is expected that work will be commenced shortly.

Tampa, Fla.—Plans have been prepared by Alexander Twomble, expert sanitary engineer of New York, for proposed sewerage system to cost $500,000.

Adel, Ga.—City will vote May 22 on $15,000 bond issue for construction of sewer system.

Decatur, Ga.—Voters have authorized $5,000 bond issue for improvement of sewerage system.

Belvidere, Ill.—Ordinance for extension of sanitary sewer system on Buchanan st., from Whitney to Main, and 130 ft. southerly on Main, has been passed under suspension of rules. Sewer is to be 806 ft. long and estimated cost with court expenses $500.

Anderson, Ind.—Steps are being taken to build sewer to eliminate Green's branch; cost, $120,000.

Evansville, Ind.—Resolution has been adopted for construction of local sewer in and along alley between Linwood ave. and Evans ave., from sewer in Hopkins ave., 926 ft. of 15-in. pipe, two manholes, four inlets.

Fort Wayne, Ind.—Resolutions have been adopted for construction of sewer to drain north of Tennessee ave. and west of Kentucky ave.; also local sewer for Colerick st.

Indianapolis, Ind.—Resolutions have been adopted for construction of sewers in various streets.

Indianapolis, Ind.—At a meeting with members of the City Council recently, City Engineer Klausmann was promised that Council would favor appropriation of $10,000 to begin work of constructing experimental disposal plant.

South Bend, Ind.—First step in plan for draining and pavement of Michigan st. throughout downtown business section has been taken, when Board of Public Works authorized resolution for improvements. Contemplated improvements will cost approximately $100,000, and will include laying of pipe sewer, 6 ft. in diameter, and replacing of present brick pavement with asphalt.

Reinbeck, Ia.—Sewer system will be constructed shortly.

New Orleans, La.—City will shortly construct Metairie Relief and Broad st. canals, including wood lining of subchannel. Bids will be received until June 20.

Opelousas, La.—City has sold $30,000 worth of sewer bonds. Bids for construction will be asked in about 30 days. Walter G. Kirkpatrick is Engineer.

Malden, Mass.—It has been ordered that $10,000 be borrowed and expended for main drains and common sewers; also that $10,000 be borrowed and expended for surface drainage.

Fort Benton, Mont.—Plans for sanitary and storm water sewers have been approved by State Board of Health of Montana, and will be ready for bids in the near future. Cost approximately $35,000. Burns & McDonnell, Engineers.

Camden, N. J.—It has been decided to construct sewers or drains in Viola st., Salem st. and Ferry ave. A. L. Sayers is Street Commissioner.

Hackensack, N. J.—The Commissioners have sent to the State Board of Health for approval plans of Engineer Frank Campbell for a sewerage system to cost $353,000.

Long Branch, N. J.—Bids for proposed sewer and sewage disposal system are being considered. Specifications prepared by Clyde Potts, of New York, call for disposal plant and two pumping stations.

Montclair, N. J.—Cost of disposal plant according to report of Herring & Gregory will be $1,080,000.

Oswego, N. Y.—Olin H. Landreth, instructor of sanitary engineering at Union College, Schenectady, has been retained as expert engineer to approve sewer plans at special meeting of Common Council. Plans are now being prepared by City Engineer Charles H. Snyder.

Schenectady, N. Y.—Board of Contract and Supply has authorized Commissioner of Public Works to construct surface water sewer connections in Campbell and Guilderland aves.

Akron, O.—Proposition of Matlick-Hopcroft system of sewage disposal, referred to Sanitary Committee of Health Board, has been submitted to Board of Control for their approval, and recommended that system be adopted by city.

Barberton, O.—Ordinance has been passed confirming plans for storm sewer for West Barberton.

Toledo, O.—Legislation providing for drainage of marsh in North Toledo has been approved by Committee on Public Improvements of Council. Drainage will be effected by building of drainage ditch and pumping water into Columbus st. sewer. Work of establishing ditch and installing pumps will cost city $16,000, and cost of maintenance to city will be $1,600 per year.

Youngstown, O.—Resolutions have been adopted for sewering Lansing ave., from Valley st. to Vine st., and for sewering Kendall st., from Edwards st. to Hillman.

Muskogee, Okla.—Ordinance has been passed creating Sewer District No. 77 and providing for construction of sewer therein. Chas. Wheeler, City Clerk.

Tillamook, Ore.—Sewer system will be constructed to cost about $50,000.

Harrisburg, Pa.—It has been decided to hire engineer to draw up plans for sanitary sewer in hollow to be built at expense of township and borough in territory controlled by each. Sewer will be large enough to drain section for years to come and will connect with system of borough. Surface drainage in Mohn st. will also be taken care of.

Lansdowne, Pa.—Commissioners of Upper Darby Township have prepared ordinance which will be adopted which calls for increase in bonded indebtedness of township of $200,000. Money is to be used in constructing sewerage system in Fernwood, Highland Park, Cardington, Garrettford, Keystone and Drexel Hill.

Pawtucket, R. I.—City will begin work of connecting its sewer system with Providence system in order that its sewage may be treated at Field's Point at once.

Pierre, S. Dak.—Bonds for sewer extensions have been carried by large vote.

Sioux Falls, S. Dak.—City Engineer has been instructed to estimate cost of construction of sewer on Phillips ave., from 11th st. to 10th st., and also through alley between Main ave. and Phillips ave., from 11th st. to 10th st.

Chattanooga, Tenn.—Bids will be received until 3 p.m., May 14, by T. C. Thompson, Mayor, for purchase of $300,000 floating indebtedness and sewer bonds.

Johnson City, Tenn.—City is receiving bids for construction of proposed 3,000 lin. ft. 6-in. sewer connections and 2,900 ft. 8-in. sewer.

Nashville, Tenn.—Bills have passed second reading appropriating $1,500 for construction of sewer in Division st.; $1,500 for sewer in alley No. 438, and $2,600 for construction of sewer in Ridley and Argile aves.

Somerville, Tenn.—City will construct

Boise, Idaho—For Main Sewer District No. 2, and Lateral Sewer District No. 111, totals are as follows: (a) Reliance Construction Co., Portland, Ore., $127,150.82; (b) Idaho Hardware & Plumbing Co., Boise, $130,089.15; (c) K. Souset, Cowallis, Ore., $156,002; (d) M. Jennings, Pasco, Wash., $142,239.18; (e) Strange & McGuire, Salt Lake City, Utah, $108,337.99; (f) Jas. Kennedy, Salt Lake, $140,031.16; (g) Jas. A. Green & Co., Boise, Idaho, $150,480.80; (h) R. M. Bardsen, Pocatello, $152,624.06; (i) D. G. Gordon, Denver, Col., $170,499.84; (j) E. W. Geiger, Salem, Ore., $98,980.16. Itemized bids as follows:

DISTRICT 2—MAIN DISTRICT.

Work.	Quant. (a)	Rate. (b)	Rate. (c)	Rate. (d)	Rate. (e)	Rate. (f)	Rate. (g)	Rate. (h)	Rate. (i)	Rate. (j)	Rate. (k)
8-in. cement pipe in place, lin. ft.	644	$0.695	$0.75	$1.00	$0.90	$1.05	$0.85	$0.82	$0.86	$1.65	.....
10-in. cement pipe in place, lin. ft.	664	.885	.94	1.10	.97	1.15	.90	.95	.94	1.75	.....
12-in. cement pipe in place, lin. ft.	974	1.00	1.05	1.25	1.10	1.32	1.02	1.02	1.19	1.80	.....
18-in. cement pipe in place, lin. ft.	3,337	1.50	1.50	1.70	1.65	1.88	1.85	1.67	1.90	1.95	.....
21-in. cement pipe in place, lin. ft.	2,281	1.95	1.90	1.90	1.90	2.29	2.20	1.94	2.53	2.30	.....
24-in. cement pipe in place, lin. ft.	1,476	2.35	2.20	2.50	2.30	2.70	2.75	2.27	3.12	3.00	.....
Cement Ys in place, number	213	1.50	1.25	2.50	1.25	1.90	.35	2.82	1.00	1.50	.....
Concrete manholes complete, number	33	45.00	42.00	40.00	50.00	54.00	40.50	40.00	48.50	43.00	$55.00
48-in. concrete and brick sewer, lin. ft.	1,530	6.00	4.80	6.50	5.25	5.52	6.50	7.40	6.25	6.50	5.85
48-in. steel pipe in place, lin. ft.	90	7.50	15.00	7.50	8.50	8.00	11.50	14.10	10.00	7.50	12.00
48-in. concrete and brick sewer, lin. ft.	1,530	6.00	4.80	6.50	5.25	5.52	6.50	7.40	6.25	6.50	5.85
48-in. steel pipe in place, lin. ft.	90	7.50	15.00	7.50	8.50	8.00	11.50	14.10	10.00	7.50	12.00
8-in. vitrified clay pipe in place, lin. ft.	644	.65	.74	1.00	.85	1.00	.77	.80	.88	1.70	.90
10-in. vitrified clay pipe in place, lin. ft.	664	.85	.94	1.10	.92	1.11	.84	.93	.96	1.80	.97
12-in. vitrified clay pipe in place, lin. ft.	974	1.00	1.15	1.25	1.10	1.32	.96	1.00	1.23	1.90	1.23
18-in. vitrified clay pipe in place, lin. ft.	3,337	1.55	1.75	1.70	1.70	1.86	1.75	1.81	2.02	2.10	1.90
21-in. vitrified clay pipe in place, lin. ft.	2,281	2.05	2.25	1.90	2.10	2.49	2.00	2.42	2.83	2.50	2.75
24-in. vitrified clay pipe in place, lin. ft.	1,476	2.45	2.50	2.50	2.55	2.94	2.40	2.94	3.42	3.25	3.00
Vitrified Ys in place, number	213	1.45	1.25	2.50	1.25	1.70	.25	2.75	1.00	1.50	.75
Brick manholes complete, number	33	48.50	45.00	40.00	50.00	54.00	47.00	49.25	48.50	43.00	55.00
DISTRICT III—LATERAL DISTRICT.											
8-in. cement pipe in place, lin. ft.	36,177	.695	.75	1.00	.90	....	.85	.82	.86	1.03	....
10-in. cement pipe in place, lin. ft.	3,778	.885	.94	1.10	.97	....	.90	.95	.94	1.15	....
Cement Ys in place, number	1,232	.60	.50	1.00	.60	....	.35	.70	.60	1.08	....
Concrete manholes complete, number	124	45.00	40.00	40.00	50.00	....	40.00	60.00	48.50	43.00	55.00
Concrete arch top manholes and flush tanks complete, number	12	116.00	100.00	125.00	110.00	....	125.00	169.00	115.00	125.00	115.00
Concrete flat top manholes and flush tanks complete, number	9	115.00	110.00	135.00	110.00	....	115.00	181.00	110.00	125.00	115.00
8-in. vitrified clay pipe in place, lin. ft.	36,177	.65	.74	1.00	.85	.97	.75	.80	.88	1.08	.90
10-in. vitrified clay pipe in place, lin. ft.	3,778	.85	.94	1.10	.92	1.05	.85	.93	.96	1.25	.97
Vitrified Ys in place, number	1,232	.50	.50	1.00	.50	.50	.25	.70	.60	1.25	.75
Brick manholes complete, number	124	51.00	45.00	40.00	50.00	54.00	50.00	40.00	48.50	43.00	55.00
Brick arch top manholes and flush tanks, complete, number	12	120.00	130.00	125.00	110.00	105.00	140.00	165.00	115.00	125.00	115.00
Brick flat top manholes and flush tanks, complete, number	9	115.00	130.00	135.00	110.00	105.00	125.00	181.00	110.00	125.00	115.00

four miles clay pipe sewers, 6-, 8-, 10- and 12-in. in diameter.

Austin, Tex.—City will vote April 30 on $250,000 bond issue for sanitary sewer construction.

Cuero, Tex.—City has voted $25,000 bond issue for sewer construction.

San Benito, Tex.—City will construct sewer system. Amount of money available, $30,000.

Wharton, Tex.—City will vote on $1,500 bond issue for sewer construction.

Chatham, Va.—City has voted $8,000 bond issue for sewer construction.

Dublin, Va.—Town is considering bond issue for sewer system and water works.

Barboursville, W. Va.—Town is planning to improve sewer system.

Warwood, W. Va.—City Council has accepted plans by W. J. Watson, engineer, Cleveland, O., for sewer system to cost about $15,000.

Warwood, W. Va.—Town is contemplating voting on bond issue to construct sewer system in North Warwood.

Cody, Wyo.—City voted $35,000 bonds for sewers on April 16. Burns & McDonnell, Engineers, will have plans completed within next 30 days, after which bids will be asked.

CONTRACTS AWARDED

Augusta, Ga.—By City, for construction of large brick sewer on Central ave., to A. J. Twiggs & Sons, at $18,524, and for small sewers, to T. C. Brittingham.

Baltimore, Md.—By Sewerage Commission, to B. F. Sweeton & Son, for building section of the new outfall sewer Contract 86, for $92,424.

Mankato, Minn.—For constructing 9,600 ft. 8- to 18-in. sanitary sewers, to Lars Overn, of St. Peter, for $10,221.

Sea Isle City, N. J.—By City Council, for construction of reinforced concrete sewer treatment tank and appurtenances, and intercepting sewer with manholes, two ejectors, etc., to J. Harvey Bennett, of Cape May City, for $30,840.

Trenton, N. J.—By Commissioners, for construction of sewer in Bellevue ave., to Gibbs & Morgan.

Trenton, N. J.—By Commissioners, for construction of sewers as follows: No. 560, Bellevue ave., Antonio De Lucio; No. 540, in an alley between Franklin and Chambers sts., Gibbs & Morgan; No. 539, Turpin st., John Toft.

Watertown, N. Y.—By Board of Public Works, for construction of Ann st. sewer, to Burns Brothers & Haley, at $868.34

Niles, O.—By Board of Control, for Leslie ave. sewer, as follows: John Dell & Somma, $438.30; Frank Manilla, $458.20; Anthony O'Horo, $338.78. For Warren and Pleasant ave., Hunter, Kelly and Clover sts., John Dell & Somma, $3,876.20; Frank Manilla, $4,420; Anthony O'Horo, $3,840.86; Burns Bros., $4,531.44. Contracts for construction of both sewers were awarded to Anthony O'Horo.

Muskogee, Okla.—By City, for constructing sanitary sewer district No. 79, to Heman Construction Co., of Muskogee.

Pearl Harbor, T. H.—For construction of sewer system at Pearl Harbor, to Lord-Young Engineering Co., Honolulu, for $29,512.

Providence, R. I.—By City Council, to Frederick E. Shaw, Providence, at $70,000 for construction of 2,700 lin. ft. of intercepting sewer. Otis F. Clapp is City Engineer.

Nashville, Tenn.—By Board of Public Works, for construction of 260 ft. sewer in alley 268, to J. R. Patton & Co.

BIDS RECEIVED

Brooklyn, N. Y.—For furnishing material and constructing sewers in 18th, 19th and 20th aves., Bay Parkway, West Side, 70th and 75th sts. Bids were received on percentage basis, as follows: W. J. Redmond Co., 527 Smith st., Brooklyn, 81.3 per cent.; John C. Schrade, 87.23 per cent.; Newman & Carey Co., 97.04 per cent.; the Donegan Co., 84.5 per cent.; Donlon Contr. Co., 105 per cent.; McCauley-Manton Co., 88.93 per cent.; James H. Holmes, 112 per cent..; Vachris & Gelardi, 86⅜ per cent.

Charlotte, N. C.—For sewer work, and lowest bid received was that of Dobbs & Meyer, as follows: 1,410 ft. 25-in., 6 ft. deep, $1.15; 3,580 ft. 20-in., 98 cts.; 6,260 ft. 18-in., 88 cts.; 4,260 ft. 15-in., 71 cts.; 1,300 ft. 15-in. 8 to 10 ft. deep, 76 cts.; 14,080 ft. 12-in., 6 ft. deep, 48 cts.; 16,730 ft. 8-in., 8 to 10 ft. deep, 42 cts.; 112 manholes, each, $27.50; 19 flush tanks, each, $45; 245 inlets, each, $22.50; rock excav. per cu. yd., $250; total, $37,884. Totals of other bids: Sullivan, Long & Hagerty, $41,796; Jas. M. Ferry & Sons, $55,760; Porter & Boyd, $47,025; S. Monroe Sons Co., $54,841.

WATER SUPPLY

Gadsden, Ala.—Ordinance has been passed providing for installation of water meters.

Gadsden, Ala.—Board of Aldermen is considering installing water meters.

Joanston, Col.—Installation of gravity system of water works, to cost $18,000, is said to be authorized.

Hartford, Conn.—Water Department plans to lay upwards of six miles of water mains in city's streets during season of 1912. Chief Engineer Saville and President Dower have worked out schedule which will be adhered to at their joint discretion. Program calls for $150,000 worth of new work. Contracts for pipe are now being entered into. Schedule prepared for Board for season is as follows: Morgan, Market to Boulevard, size, 24 in., length, 660 ft.; Market, Morgan to Pleasant, size, 12 in., length, 920 ft.; South Ann st. (complete), size, 10 in., length, 360 ft.; Wells and Trumbull to Jewell, size, 24 in.; length, 1,330 ft.; New Park ave., Park to Grace, size, 16 in.; length, 750 ft.; New Park ave., Grace to Flatbush, size, 12 in.; length, 5,400 ft.; New Britain ave., Newfield to White, size, 12 in.; length, 3,150 ft.; Wethersfield ave., South to Victoria, size, 12 in.; length, 2,765; Wethersfield ave., Annawan to Preston, size, 12 in.; length, 3,750 ft.; Annawan st., size, 12 in.; length, 1,050 ft.; Bond st. (complete), size, 10 in.; length, 2,620 ft.; Morris st., size, 8 in.; length, 1,000 ft.; Boulevard, Prospect to Whiting, size, 8 in.; length, 3,100 ft.; Cedar st. (complete), size, 6 in.; length, 1,220 ft.; Wadsworth st. (complete), size, 8 in.; length, 1,165 ft.; Squire st. (complete), size, 6 in.; length, 640 ft.; Affleck st. (complete), size, 6 in.; length, 725 ft.; Park Terrace, Summit to Hamilton, size, 16 in.; length, 1,400 ft.; Freeman st., extending to Maple, size, 8 in.; length, 460 ft.; Homestead ave., Oakland Terrace west, size, 8 in.; length, 290 ft.; Franklin ave., Maple to Annawan, size, 12 in.; length, 650 ft. total length, 33,405 ft.

Wilmington, Del.—City Council has passed resolution offered by Col. W. E. Stover, chairman of Finance Committee, providing for form of bond for $45,000 bond issue for refunding water bonds sold several weeks ago.

Washington, D. C.—Government of Latin-American country has voted $10,000 for purchase of deep-well-sinking plant and sinking one or more trial wells. Ground is of alluvial character. American firms interested should address official whose name is given in report submitted by American consul. No. 8671, Bureau of Manufactures.

Fort Meade, Fla.—City has voted $19,000 bond issue for water works.

Lake Helen, Fla.—City will vote on bond issue for installation of water works.

Cartersville, Ga.—Extension of water mains has been authorized.

Monticello, Ga.—Election will be held May 6 for voting on $8,000 bond issue for water works system.

Charleston, Ill.—Bonds in sum of $40,000 is said to be voted for improvement to water system.

Springfield, Ill.—Report of Engineer D. B. Maury, of Peoria, on water supply problem at Anna State Hospital has been accepted by State Board of Administration. Board has decided to construct impounding basin five miles from hospital and pipe water from this place to hospital. Cost of improvement will be $104,305, much less than cost of pipe line from river to hospital, nine miles distant. Legislature appropriated $135,000 for water works system.

South Bend, Ind.—Specifications for the remodeling of Leeper Park water works station, at cost of approximately $23,000, have been made public by Board of Public Works and Superintendent Thomas Ayres.

South Bend, Ind.—Preparations for $200,000 worth of improvements in Water Works Department have been made by Board of Public Works in approval of $10,000 contract for 20 new wells. Wells will be 10-in. in size and will be sunk 50 ft. apart in Leeper Park just north of Foote st.

Paulina, Ia.—Bond issue of $8,000 has been voted for installation of water works and electric light plant.

Chapman, Kan.—City has completed sinking of wells for its water supply and bids will be asked within next 30 or 40 days for general construction and material. Burns & McDonnell, Engineers.

Henderson, Ky.—Filter Committee of Common Council will recommend to that body that bonds to amount of $75,000 be issued for construction of filter, and that proposition be submitted to vote of legal electors at November election.

Eastondale, Mass.—Election will shortly be held for voting on installation of water works.

Reed City, Mich.—John H. Bloomshield is preparing plans for remodeling of water works pumping station in Reed City. High water carried out private dam above works and this put pumping station out of commission.

Biloxi, Miss.—There will be special meeting of City Council for purpose of passing final ordinance which will consummate sale of $70,000 water works bond issue to Interstate Trust & Banking Co., of New Orleans.

Maryville, Mo.—Board of Public Works has advised City Council to issue $100,000 in bonds for installation of municipal water plant.

Billings, Mont.—City has signed contract with Burns & McDonnell, Engineers, for making complete plans and specifications for new water works plant, together with appraisement of property owned by Montana Water Co.

Silver Creek, Neb.—Installation of water works is being considered.

East Orange, N. J.—Issue of $100,000 water bonds, authorized at previous meeting of Council, has been awarded to Essex County Trust Co., of East Orange.

North Plainfield, N. J.—Council has made 10-year contract with Plainfield Union Water Co., to supply water from Netherwood wells only.

Ballston Spa, N. Y.—Appropriation of $10,000 is under contemplation for installation of water meters.

Binghamton, N. Y.—Construction of addition to filter plant, to cost about $75,000, have been authorized by Board of Water Commissioners.

Fayetteville, N. Y.—Bids will be received by Village Trustees until May 1, for $15,000 water bonds.

Lowville, N. Y.—Installation of water meters has been authorized.

Mechanicville, N. Y.—Village Board has sold $12,000 worth of refunding water bonds to Curtis & Sanger.

Middleport, N. Y.—State Conservation Commission has approved plans and specifications for proposed water system in this village which will be installed at a cost of $50,000. Board of Water Commissioners have advertised for bids for proposed system, which includes about 10 miles of piping, pumping station, standpipe, etc.

Oswego, N. Y.—Department of Water has authorized Superintendent Ormsby to purchase necessary amount of pipe and other material to be used in making extensions of lake water system in outlying sections of city.

Schenectady, N. Y.—Board of Contract and Supply has rejected all plans for supplies for Bureau of Water, and will advertise for bids. Aggregate bids opened for supplies were as follows: Hays Manufacturing Co., of Erie, Pa., $1,917.62; A. P. Smith Co., East Orange, N. J., $1,947.60; H. Mueller & Co., New York, $2,035.50; Glauber Brass Manufacturing Co., Cleveland, $1,905.76.

Staten Island, N. Y.—Water Department of city of New York has planned to extend water mains of Tottenville pumping station through several of streets of Pleasant Plains, Prince Bay and Tottenville.

Bedford, O.—Bonds will shortly be issued for water works.

Columbus, O.—Lowellville Water Co. has applied to Public Service Commission for right to issue bonds in sum of $50,000 and $25,000 worth of stock, same to be used for building of plant.

Dover, O.—Ordinance is said to have been passed for improving of water works.

Salem, O.—Water mains will be laid by Water Department on following streets: Wilson, from end of present main to Pennsylvania Railroad, 450 ft., at estimated cost of $360.50; South Penn st., from Perry to Euclid, 600 ft., at cost of $498; and on Maple st., extension of 400 ft., at cost of $360.

Springfield, O.—Petition will be presented asking for improvement of West Washington st., Thompson ave. and Severs st. by installation of water.

Eugene, Ore.—Water Board has ordered number of water mains installed in various parts of city.

Pilot Rock, Ore.—Construction of water works is being considered.

Erie, Pa.—State Health Commissioner Dixon has approved plans for water filter system for city of Erie. Plans call for 25,000,000-gal. mechanical process filter plant, water being taken from Lake Erie.

Erie, Pa.—All of plans submitted by Board of Water Commissioners for their contemplated improvements have been

approved by State Health Commissioner Samuel G. Dixon and he has issued permit instructing department to proceed with work. The Board is planning to spend $600,000 in four years for improvements. Work is being rushed on foundation for standpipe in South Erie.

Barnwell, S. C.—Plans are being prepared for installation of water works.

Bowdle, S. Dak.—Town is considering construction of water works system to cost about $13,000. H. C. Gross is City Auditor.

Covington, Tenn.—City has planned to construct about 3,500 ft. of new water mains.

Rogersville, Tenn.—Gale P. Kyle has been granted franchise to construct water works.

Chatham, Va.—City has voted $2,000 bond issue for installation of water meters.

Clifton Forge, Va.—Citizens have voted to issue bonds to purchase local water company.

Toppenish, Wash.—Improvements have been planned to municipal water plant.

Ackerman, Wis.—Bond issue of $15,000 is being considered for completion of municipal water works.

Kenosha, Wis.—At special meeting of Commission plans for new receiving well have been approved and work will be started at once. Well will cost $6,500 and will largely increase pumping capacity of water works. It will have a capacity of 1,600,000 gals.

CONTRACTS AWARDED

Donnellson, Ia.—To Des Moines Bridge & Iron Works Co., of Des Moines, Ia., for following: 5,370 ft. of 8-, 6- and 4-in. pipe; seven valves, 15 hydrants and 40,000-gal. steel tank on tower.

Shreveport, La.—For construction of dam at foot of Caddo Lake at Mooringsport, to H. B. Thompson Co., of Kansas City, Mo.

Lowell, Mass.—For about 11,500 ft. of galvanized wrought iron pipe of different dimensions; service pipe for Water Department, to Harry S. Drury, at $642.55. Other bids as follows: Farrell & Conaton, $644; T. Costello & Co., $646.11; Middlesex Machine Co., $685; Tenney Morse & Co., Boston, $698; Carroll Bros., $698; E. A. Lynde, Boston, $738.90; John A. Cotter & Co., $745.

Duluth, Minn.—For furnishing approximately 17,784 lin. ft. of 12-in. lap-welded steel pipe, with sarco mineral coating, to Marshall Wells Hardware Co., Gilfillan Block, Minneapolis, at 85.4 cts.

Rosalie, Neb.—For constructing water system, to Katz-Craig Contracting Co., Omaha, Neb., at $7,680.

Atlantic City, N. J.—For 10,000,000-gal. horizontal or vertical condensing steam turbine engine and centrifugal pump, to Dravo-Doyle Co., Arcade Bldg., Philadelphia, at $9,986.

Brooklyn, N. Y.—By City, for building 30-in. main from Hoffman blvd. along Union Turnpike and Fresh Meadow rd. to Flushing pumping station near Kissina Park, 2½ miles, to Murphy Bros., of Brooklyn, at $125,666.95. Building a 24-in. main from Bay Side pumping station to Flushing standpipe, three miles in length, to Peace Bros., at $92,293.50. For furnishing and delivering and laying mains for 30 or 40 residence streets in Long Island City and town of Flushing, for domestic purposes, to Peace Bros., at $89,814. To F. J. Clancy, to haul and lay lateral mains in Long Island City and Flushing, at $23,684.05, the city to furnish all iron pipe and all other material. Work is to be completed before end of next fall.

Schenectady, N. Y.—By Board of Contract and Supply, for furnishing water pipe, to Charles Miller & Son Co., of Utica. Other bidders were: R. D. Wood & Co., Philadelphia; U. S. Cast Iron Pipe & Foundry Co., Philadelphia, and Donaldson Iron Co., of Philadelphia.

Albemarle, N. C.—For constructing water system to include pumping station, clear water basin, deep well, two motor-driven turbine pumps, 750-gal. per minute each, switchboard and one mile of pole line, tower and tank and about five miles of 6- to 10-in. pipe line, to Central Construction Co., Lexington, Ky. Gilbert C. White, Charlotte, N. C., is Engineer.

Avard, Okla.—By City Council, to C. E. Humrichouse, of Carmen, Okla., to install water works to include five miles of mains; water to be brought from large springs south of town.

Holdenville, Okla.—By City, for furnishing machinery for extending and improving water system, to E. J. Merkle & Co., of Kansas City, Mo., for $19,808, and for pole line material, to Western Electric Co., for $1,435.

Pawhuska, Okla.—By City Council, to Kennedy & Fleming, of Oklahoma City, for equipment and machinery in extensive improvements for city water works and electric light plant; contract includes three high-pressure boilers, two Corliss engines, two 10,000,000-gal. centrifugal pumps and auxiliaries.

Pittsburgh, Pa.—For waterproofing, repairing, furnishing and placing additional materials in Filters 47 to 56, to John F. Casey, Oliver Bldg., Pittsburgh, at $134,918.

Madison, S. Dak.—To Deane Steam Pump Co., of Madison, for furnishing 600-gal. pump, 60 horsepower Remington oil engine, 400-gal. pump and a 40 horsepower Westinghouse motor, at $7,254.

Seattle, Wash.—For laying of water mains on Nickerson st. and Dexter ave., to International Dredging Co., at $15,068.94.

Spokane, Wash.—By City Council, for bituminous cement for new Lincoln Heights reservoir, to F. T. Crowe & Co., at $44.50 a ton.

Wausau, Wis.—By Water Commissioners, to Snow Steam Pump Works, of Buffalo, N. Y., for new pump at water station of 6,000,000-gal. daily capacity, at $14,180.

LIGHTING AND POWER

Alameda, Cal.—Citizens will vote on April 30 on $150,000 bond issue for construction of municipal electric light plant.

Lake Helen, Fla.—City will vote on bond issue for installation of electric light plant.

Cartersville, Ga.—Commissioners of city of Cartersville will submit bond issue of $50,000 early in May for purpose of installing day current of electricity by adding another unit to present plant.

Indianapolis, Ind.—City Council will favor appropriation of $5,000 for additional street lighting.

South Bend, Ind.—Plans for installation of system of cluster lights on Park ave. have been completed.

South Bend, Ind.—Contract between City and Welsbach Street Lighting Co. of America, Chicago corporation, for continuation of agreement for lighting of River Park, has been sanctioned by City Council.

Paulina, Ia.—Bond issue of $8,000 has been voted for installation of electric light plant and water works.

Atlantic City, N. J.—City will sell 200 old gas lamps.

Elizabeth, N. J.—Ornamental lighting of Broad st. is being discussed.

Amsterdam, N. Y.—Special committee appointed by Mayor Dealy to look into feasibility of securing water power from city distributing reservoir with which to propel a municipal lighting plant is busily engaged securing data.

Newburgh, N. Y.—Resolution has been approved by Mayor Corwin authorizing improvement of lighting system and illumination of Broadway, from Colden to William st., by use of ornamental lighting poles, and authorizing same work on Second st., with appropriation of neces-

Northville, N. Y.—Broadalbin Electric Light & Power Co. have been granted a franchise to supply electric current.

Rochester, N. Y.—A more modern system of lighting is being discussed for Oxford st.

Oneida, N. Y.—City has come to terms with Adirondack Electric Power Corporation for lighting city for term of four years and 11 months. The original figures are cut down from $8,000 to $5,800. For first 11 months of contract, ending January next, city will pay sum of $5,316.63, and for remaining four years price will be $5,800 a year.

Akron, O.—The N. O. T. & L. Co. has agreed to enter into contract with city to furnish arc lights at $55 a year for 10-year period on all night schedule. For five-year contract at $60 a light. At present city is paying between $78 and $80 per light for moonlight schedule.

Salem, O.—City is still considering building municipal electric light generating plant.

Springfield, O.—Petition will be presented asking for improvement of West Washington st., Thompson ave. and Severs st. by installation of gas.

Carbondale, Pa.—Movement has been started for placing of number of ornamental electric light standards on South Main st., between Sixth and Seventh aves.

Philadelphia, Pa.—Better lighting on principal trade arteries of northern section of city is being discussed.

Windber, Pa.—Council is considering proposition to replace present system of lighting streets with new and better one.

Anderson, S. C.—W. W. Hess and associates of Philadelphia, have secured franchise from City Council to erect and maintain gas plant in Anderson. The life of franchise is 50 years; maximum price to be charged for gas is $1.60 less 10 cts. per 1,000 cu. ft.

Nashville, Tenn.—By unofficial majority of 1,365 out of 5,135 votes cast, voters of Nashville ratified action of City Council in granting to Nashville Gas & Heating Co. right to take over plant of Nashville Gas Co. and in giving company 40-year franchise to operate plant here.

Dallas, Tex.—City Electrician Leon M. Taylor has said that in figuring estimates for installing municipal lighting plant with connections to furnish all lights for streets he will use magnotype light.

Dallas, Tex.—Committee of Chamber of Commerce in charge of ornamental lighting system for Main and Commerce sts. will meet with Mayor and City Commissioners at City Hall to discuss ways and means for securing new lights as soon as possible.

CONTRACTS AWARDED

Buffalo, N. Y.—By Commissioner of Public Works, to Power Plant Specialty Co., 111 Broadway, New York, for feedwater superheaters and purifying system to be installed at Massachusetts ave. pumping station.

Holdenville, Okla.—For generators and other electrical apparatus, to E. J. Merkle & Co., Kansas City, Mo., at $19,808.

Geadon, Pa.—By Borough, for street lighting system, for term of five years, to Delaware County Electric Co.

Richmond, Va.—For additional equipment for municipal electric plant, by Committee on Electricity, to General Electric Co. Among other things, contracts call for transformer at power house, which will cost $1,345.40; 10 street transformers at $82 each, and 71 arc lamps of new type.

Seattle, Wash.—By City Lighting Department, for supplying 358,000 incandescent lamps, to Northwestern Electric & Supply Co., of Seattle, for $84,539.

FIRE EQUIPMENT

Alameda, Cal.—Citizens will vote on April 30 on $8,000 bond issue for construction of fire alarm and police telephone system.

Alameda, Cal.—Citizens will vote on April 30 on $42,000 bond issue for purchase of automobile fire apparatus.

Santa Clara, Cal.—Purchase of motor combination chemical and hose car is being discussed.

Sunnyvale, Cal.—Council is contemplating purchase of 500 ft. of new hose.

Meeker, Col.—Additional fire apparatus will be installed.

Valdosta, Ga.—Purchase of 1,000 ft. of fire hose will be made by Chief Preston Brooks.

Des Moines, Ia.—City is considering purchase of two motor fire trucks, at cost of $11,000.

Ellsworth, Me.—Purchase of new hose is being considered.

Lynnfield, Mass.—Question of purchasing new chemical engine is being considered by Fire Department.

Calumet, Mich.—Purchase of better fire apparatus is being considered.

Kansas City, Mo.—Purchase of three triple motor combination pump, chemical and hose cars, three motor cars and one hook and ladder truck has been asked for by Fire Chief.

Hoboken, N. J.—Purchase of new combined chemical and hose cart, to cost $5,500, has been authorized.

Auburn, N. Y.—Sun of $22,000 will be expended in purchase of motor apparatus.

Niagara Falls, N. Y.—Bids for two fire halls, cost $15,000 and $8,000 respectively, will soon be asked.

Schenectady, N. Y.—It has been decided to advertise for bids on 2,000 ft. of fire hose and for bids on certain appliances needed by Superintendent Bentley, of Water Bureau.

Oreswell, Ore.—Purchase of new hose has been authorized.

Altoona, Pa.—Purchase of new auto fire truck is being discussed.

Chambersburg, Pa.—An aerial truck will be purchased for Franklin Fire Co.

Lansdowne, Pa.—Lansdowne Council has passed an ordinance making an appropriation of $6,500 for the purchase of an auto fire engine.

Pawtucket, R. I.—Purchase of motor apparatus for station in South Woodlawn district has been authorized.

Pawtucket, R. I.—Council will authorize appropriation of $7,500 for purchase of motor fire apparatus for West ave. fire station.

Warren, R. I.—Appropriation of $700 has been made for purchase of rubber clothing for firemen.

Sioux Falls, S. Dak.—Chemical engine will be purchased for east side.

Abilene, Tex.—Bonds will be issued for purchase of additional fire equipment to cost $17,000.

Green Bay, Wis.—City has decided to purchase 500 ft. of fire hose.

Racine, Wis.—Two or three pieces of motor apparatus will probably be purchased.

CONTRACTS AWARDED

Sacramento, Cal.—By Board of Trustees, for two auto chemical engines, to J. B. Jeffrey Co., at $9,500 each.

Jacksonville, Fla.—Eureka Fire Hose Manufacturing Co. has been awarded contract for 2,000 ft. 2½-in. hose, at $1.10 and Fabric Fire Hose Co., 1,000 ft. 3-in., at $1.30.

Salem, Mass.—By City, for purchase of auto chemical truck from American-La France Co., for $5,800. Machine is swift and powerful, having alleged speed of 60 miles an hour, and carrying large chemical tanks and much firefighting apparatus.

North Bergen, N. J.—By North Bergen Township Committee, for erection of two new fire houses. For Overlook house, to Vroman & De Kimpe, of North Bergen, at $4,400. Contract to build Excelsior house, to cost $4,418, went to Ensminger Bros., of New Durham.

Niagara Falls, N. Y.—For automobile apparatus for Fire Department, by Commissioners, to Werick Brothers, of Buffalo, for chief's auto, for $1,775; Peter Lammerts, combination chemical and Knox hose automobile, for $5,000, and Ahrens-Fox Co., of Cincinnati, auto combination fire engine, for $10,000.

Mount Gilead, O.—For constructing reinforced concrete bridge over Whetstone Creek, to Hackendorn Contracting Co., at $7,329.

Nashville, Tenn.—By Board of Public Works, for supplying 500 ft. of rubber fire hose and 500 ft. of canvas hose, to Eureka Fire Hose Co., at $1.27 per ft. for rubber hose, and to Consolidated Rubber Co., at 90 cts. per ft., for canvas hose.

BRIDGES

Muncie, Ind.—Matter of constructing bridge across White River at Main st. in western part of city is being discussed by members of County Council. County Commissioners are asking that appropriation of $7,000 be made for bridge.

Rahway, N. J.—War Department has returned plans of bridge over Rahway River to Freeholders as unsatisfactory.

Hamilton, O.—Plans have been ordered for new bridge at McCurley Farm in Fairfield Township. Cost will exceed $1,500.

Chattanooga, Tenn.—Modern bridge will shortly be erected on Vine st., over Southern Railway tracks. New bridge will in general way be similar to one recently completed on McCallie ave. over Southern tracks—concrete and steel. Estimated cost is $16,532.96. Among items making up this cost are found following: Reinforced concrete, 1,100 cu. yds.; concrete railing, 310 lineal ft.; paving brick, 25,110; reinforcing steel, 70,000 lbs.; excavation for foundation, 700 cu. yds.

Fort Worth, Tex.—Bonds have been signed authorized for building of bridges and roads in Tarrant County, $1,600,000 in amount.

CONTRACTS AWARDED

Santa Cruz, Cal.—For constructing 100-ft. steel truss bridge over Soquel Creek, to Nelson Mosher, of Santa Cruz, for $4,865.

Indianapolis, Ind.—To Dennis J. Bush, for repair work that is to be done on two bridges in south part of county, by Board of County Commissioners. Bush will repair Buck Creek bridge for $467, and Bean Creek bridge, in Churchman rd., for $484.

Oswego, N. Y.—To Groton Bridge Co., for building bridge over hydraulic canal at foot of East Mohawk st. The contract price is $1,294.

Circleville, O.—For constructing riveted high truss bridge of two 125-ft. spans, by Auditor of Pickaway County, as follows: Superstructure, to Oregonia Bridge Co., Lebanon, Ind., at $9,500; substructure, to Reicnelduffer Bros., Circleville, at $4,805.

Cleveland, O.—For rebuilding bridge on McCracken rd., Bridge Report No. 2919, to William McDowell & Son, 10,319 Miles ave., Cleveland.

Hamilton, O.—For constructing bridge over canal at Grand blvd., to Albert S. Fox, Hamilton, at $9,927.

Napoleon, O.—By County Commissioners, to Toledo Crane & Bridge Co., for repairing Perry st. river bridge.

Blountville, Tenn.—For constructing three steel bridges across Holston River, by Sullivan County Court, to Converse Bridge Co., Chattanooga, Tenn.; estimated cost, $25,000.

Rankin, Tenn.—For constructing steel bridge with reinforced concrete substructure, at Rankin, to Virginia Bridge & Iron Co., Roanoke, Va., at $9,300.

Salt Lake City, Utah—By County Commissioners, for construction of wooden bridge across Big Cottonwood Creek, to Midland Bridge Co., at $1,433.

BIDS RECEIVED

Syracuse, N. Y.—By Board of Contract for repairing and reflooring bridge at W. Jefferson st., crossing Onondaga Creek: John Young, $5,482; Samuel Bonn, $6,489; C. T. Hookway Constr. Co., $6,063; General Erecting Co., $6,486.

Monessen, Pa.—For furnishing material and constructing reinforced concrete viaduct 500 ft. long and 32 ft. wide; L. J. Mensch Co., $53,350; H. C. Brooks Co., $57,000; Bowman Bros., $59,500; Nicola Building Co., $52,329; C. B. Clark Co., $51,000; Cullen-Friestedt Co., $66,727.

MISCELLANEOUS

Fort Smith, Ark.—New police alarm or signal system is being considered.

Lakeland, Fla.—Bond Trustees of city of Lakeland have sold $150,000 worth of municipal bonds to Farson, Son & Co., of Chicago.

Los Angeles, Cal.—Mayor Alexander recommends that Los Angeles should at once make plans for establishment of suitable garbage disposal plant.

Pasadena, Cal.—Bids for incinerator will probably be invited at next meeting of City Council. Two sets of specifications have been drawn up, one for 45 ton plant and one for 90-ton plant. Bids will be invited on both kinds.

Pasadena, Cal.—Bid of Security National Bank for purchase of $60,000 worth of incinerator bonds has been accepted.

San Francisco, Cal.—New bids for construction of Geary st. rd., from Fifth ave. to Kearny st., have been asked by Board of Public Works.

Sisson, Cal.—Bid of G. G. Blymyer Co., of San Francisco, for $40,000 municipal bond issue of town of Sisson has been accepted by Board of Trustees.

Jacksonville, Fla.—Erection of another crematory, of most modern and approved type, to cost approximately $45,000, has been recommended to help with destruction of garbage.

Jacksonville, Fla.—Board of County Commissioners of Duval County, Florida, will received bids for purchase of $250,000 of Duval County bonds at Clerk's office in Court House at Jacksonville, Fla., at or before 12 o'clock noon on Saturday, the 4th day of May A.D., 1912. P. D. Cassidey, Clerk.

Barbourville, Ky.—Committee of Bell County citizens are working for a bond issue.

Boston, Mass.—In executive session committee on metropolitan affairs voted to report omnibus bill appropriating $1,000,000 to be expended by Park Commission for parks and boulevards.

Malden, Mass.—Order providing for appropriation of $5,000 to be spent for incinerator for Health Department has been referred to Finance Committee.

Salem, Mass.—City of Salem has acquired land at corner of Central and Charter sts. for new building, to be used for police station, court house and electrical department station. Plans for building have been prepared. City will spend about $100,000 for improvement.

Paterson, N. J.—Sum of $175,000 in bonds will be issued for park improvements, some of which have already been made.

Paterson, N. J.—Road Committee has been authorized to solicit bids for further extension of wall along Little Falls turnpike, up to breakwater. This will leave only small stretch of wall unfinished.

Youngstown, O.—Ordinance has been passed for issuance of $200,000 in bonds for erection of new city hall.

Erie, Pa.—Special meeting of Common Council has been called to consider garbage question. Committee appointed to select site for plant will recommend purchase of G. C. Boughton farm, south of city.

Pittsburgh, Pa.—Plans for new market house have been carefully considered by Pittsburgh Marketing Club, and will be presented shortly to City Council.

Chattanooga, Tenn.—Park improvement have been authorized including $1,600 for fencing; $680 for water system; drainage, $1,400; playground equipment, $4,600.

Chattanooga, Tenn.—Bids will be received until 5 p.m., May 14, by T. C. Thompson, Mayor, for purchase of $250,000 public park bonds.

Petersburg, Va.—City Engineer Budd, by direction of Common Council, has made survey and plat of whole flooded district in lower section of city. Plan of improvement recommended by engineer it is estimated will cost $82,000.

CONTRACTS AWARDED

Hartford, Conn.—By Board, to City Coal & Wood Co., to furnish No. 1 standard deep socket vitrified salt glazed sewer pipe for ensuing year, at following prices: Eight to 24-in., at 78 per cent. discount from eastern manufacturers' list and 2 per cent. for cash within 15 days; also for furnishing Plainville sand, to H. R. Walker Co., at $1.10 per cu. yd.; by carload at 90 cts. per cu. yd., city to do unloading, and for Alpha Portland cement, for season, to Swift & Upson Lumber Co., at following prices: April, $1.37 per bbl.; May 1 to Jan. 1, 1913, at $1.42 f. o. b. cars at Holmes switch, Berlin.

Indianapolis, Ind.—To American Boiler & Sheet Iron Works, for 61 culvert pipes at cost of $2,066.70.

Shreveport, La.—By City Council, to Stewart McGee Construction Co., to erect coliseum at State Fair Grounds, at $29,860.

Lowell, Mass.—For edgestone and circle stone, 10,000 ft. in all, to John Marnell, of Graniteville. His bid for straight stone was 32½ cts. a ft. and 48 cts. a ft. for circle stone. The Hildreth Granite Co. bid 38 cts. for straight stone and 54 cts. for circle stone. L. P. Palmer & Son bid 34 cts. for straight and 48 cts. for circle stone.

Buhl, Minn.—To Bowe, Burke & Co., of Duluth, to erect the village hall, at $25,497.

Schenectady, N. Y.—By Board of Contract and Supply, for new seven-passenger six cylinder touring car, to Troy Motor Carriage Co., at $2,000. Following bids were also received: B. A. Burtiss, Chalmers, $3,250 (no certified check); F. V. Clute, of Cohoes, Pope-Hartford, $4,000; Mitchell Motor Car Co., of New York, $2,400; Clark Witbeck, Alco, $4,800, and Taylor Auto Co., of Albany, Loco, $4,800.

Salem, Ore.—By Public Buildings Commissioners, for furnishing and erecting structural steel for State Supreme Court and Library Buildings, from plans of W. C. Knighton, Architect, State Capitol Bldg., to United States Products Co., Portland, Ore., for $22,949.

Butler, Pa.—By Finance Committee of Council, for improvements to be made on old-new "City Hall" on North Main st., to McManus & Dershimer.

Easton, Pa.—To Amandus Steinmetz, to erect extension to Public Library, at $25,000.

Lebanon, Pa.—By County Commissioners, as follows: To Charles O. Bressler & Co., metal window frames and sash for windows in Court House vaults. Approximate cost will be about $200. To York Safe & Lock Co., York, doors and metal shutters for vaults, to cost approximately $1,200.

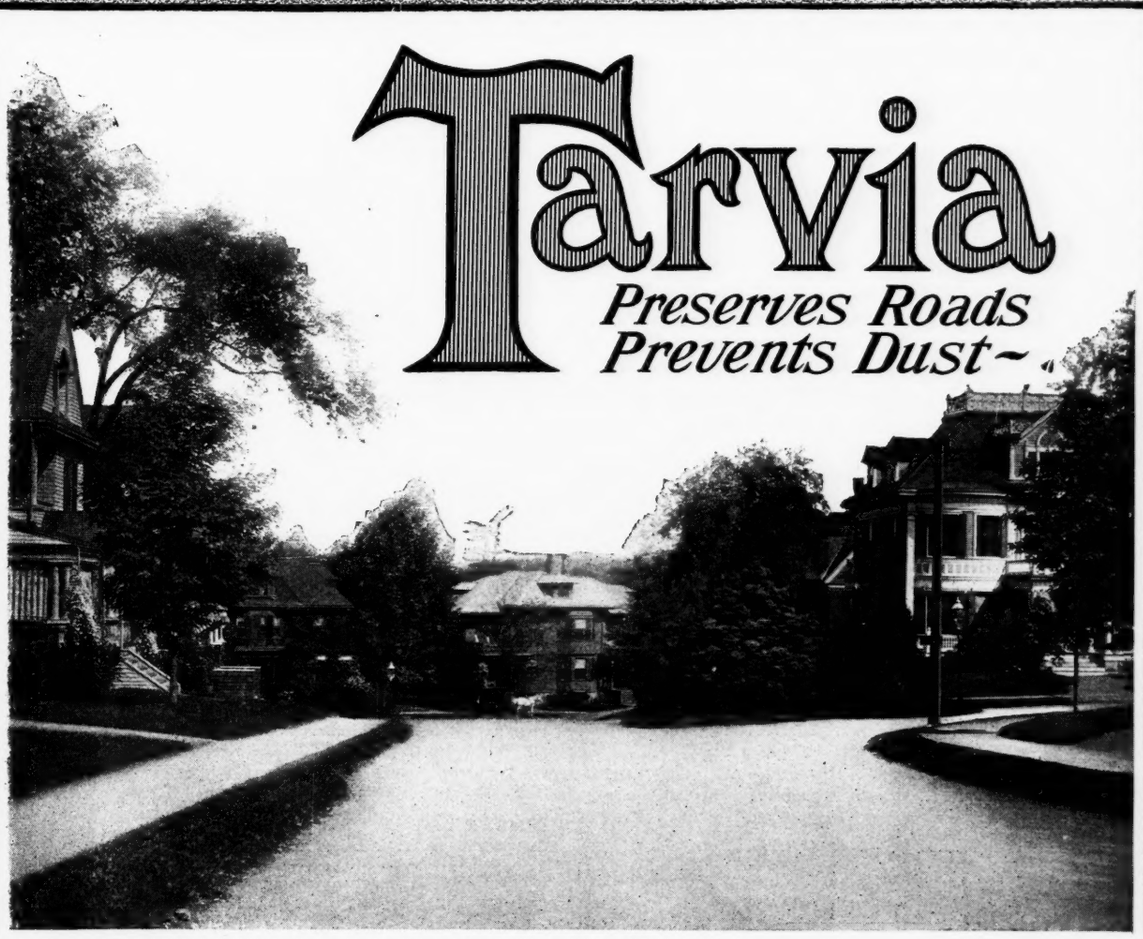
Pittsburgh, Pa.—By Bureau of Supplies, for purchase of three automobile trucks, to Alco-Pittsburgh Sales Co., at $5,675 apiece.

Pittsburgh, Pa.—By Bureau of Supplies, for five auto-propelled police patrols, to White Co., at $3,300 each.

Waupun, Wis.—To C. R. Meyer & Son, of Oshkosh, by State Board of Control at Madison, contract to erect hospital for criminal insane at Waupun, at $49,547.

BIDS RECEIVED

Galveston, Tex.—Bids for automobile ambulance and 1-ton truck were received as follows: Interstate Sales Co., ambulance $3,600, truck $3,450; Pete Cummings, agent, ambulance, $3,497; A. W. H. Michael, agent Franklyn Motor Co., ambulance $3,650, truck $2,600; A. W. H. Michael, agent Burdick Auto Co., ambulance $3,054, truck $2,400; Fred M. Lege, Jr., agent, ambulance $1,800, truck $2,400; Island City Garage, ambulance $3,275, truck $2,200; L. P. Tschumy & Co., ambulance $3,300, truck $3,300; Crane & Breed, Cincinnati, O., ambulance, $4,300; Blum Hardware Co., ambulance $3,000, truck $1,750.



Hunnewell Avenue, Newton, Mass. Roads treated with Tarvia-B.

Newton's Experience with Tarvia

IN Newton, Mass., the Hunnewell Hill District, one of the finest residential sections, was treated consistently for the three successive seasons of 1908, 1909 and 1910 with "Tarvia-B," as a road binder and dust layer, to enable the macadam streets of this beautiful section to withstand automobile traffic.

In the spring of 1911 the roads were still in such good condition that it was not deemed necessary to re-treat them and they successfully passed the season without further attention.

On Washington Street and Waverly Avenue, for example, "Tarvia-B" was used year after year, but each year the amount of Tarvia required to put the road in first class condition has diminished; and during last season the treatment was omitted entirely.

The expense for each application has been low, and the cost has decreased each year. In 1910 it fell below three cents per square yard and the omission of the 1911 treatment made the annual cost extremely low. Residents are enthusiastic over the appearance of the streets, which are smooth and hard enough to be cleaned with brooms, yet sufficiently absorbent to remain dustless.

In 1906 the automobile had practically ruined the Newton Boulevard, which has long been reserved for automobiles. "Tarvia-A" has been used since 1906 and has brought about great economies.

In the spring of 1910 and again in 1911, after the "Tarvia-A" treatment had been down from three to five years, a foreman and three men did in a week all the repairing necessary on five miles of roadway. The thoroughfare was then in an admirable condition for the summer traffic. No water has been used on the Boulevard since the Tarvia work began, yet it remains dustless and clean at all seasons.

There is nothing unusual about Newton's experience. Scores of localities are reducing their maintenance cost on their macadam streets in the same way. The use of Tarvia has become standard wherever there has been thorough experimentation.

Illustrated booklet free on request. Address our nearest office.

BARRETT MANUFACTURING CO.

New York, Chicago, Philadelphia, Boston, St. Louis, Cleveland, Pittsburgh, Cincinnati, Kansas City, Minneapolis, New Orleans, Seattle, London, Eng.

The Paterson Mfg. Co., Ltd.: Montreal, Toronto, Winnipeg, Vancouver, St. John, N. B., Halifax, N. S.

TRADE B MARK

TOO LATE FOR CLASSIFICATION

BIDS ASKED FOR

State	City	Received Until	Nature of Work.	Address Inquiries to
			STREET IMPROVEMENTS.	
Pennsylvania..	Hazleton.....	May 3, 4 p.m.....	Constrn. sidewalks, curbs, footways and gutters.....	B. E. Youngman, City Engr.
North Dakota..	Bismarck.....	May 6, 8 p.m.....	Grad. street.....	R. H. Thistelthwait, City Aud.
Tennessee....	Chattanooga.....	May 6, 10 a.m.....	Constrn. vitrified brick pav't.....	A. N. Sloan, Comm.
Texas.....	Galveston.....	May 6, noon.....	Furn. 1,723 cu. yds. mudshells.....	D. E. Austin, Comm.
Indiana.....	Salem.....	May 6.....	Constrn. road in Vernon township.....	County Aud.
Indiana.....	Indianapolis.....	May 6, 11 a.m.....	Pavg. sidewalks and alleys.....	C. A. Schrader, Pres. Bd. Pub. Wks.
Illinois.....	Roseville.....	May 6, 9 a.m.....	Constrn. 30,000 yds. asphaltic concrete.....	O. P. Steflean, Pres. Bd. Local Imp.
Indiana.....	Versailles.....	May 6, 1 p.m.....	Constrn. macadam road.....	J. F. Lochard, Aud.
New Jersey...	Jersey City.....	May 6, 2 p.m.....	Imp. Logan avenue.....	E. B. See, Clk. Street Comm.
Virginia.....	Boydton.....	May 7.....	Constrn. 15 miles macadam and 78 miles gray soil road....	P. St. J. Wilson, Highway Comm.
New Jersey...	Newark.....	May 7, 3 p.m.....	Furn. 7,000 tons crushed stone.....	A. Church, Sec'y Park Comm.
Ohio.....	Akron.....	May 7, 1 p.m.....	Constrn. 2 miles bituminated concrete.....	County Comm.
Indiana.....	Martinsville.....	May 7.....	Constrn. gravel road.....	J. S. Whitaker, County Aud.
Indiana.....	Paoli.....	May 7, 2 p.m.....	Constrn. roads.....	A. B. Ham, County Aud.
Indiana.....	Bloomington.....	May 7, 2 p.m.....	Constrn. roads.....	H. Blakely, County Aud.
Washington...	Colville.....	May 8, 2 p.m.....	Constrn. highway.....	L. E. Jessupp, County Aud.
Pennsylvania..	Easton.....	May 8.....	Constrn. Dolarway pav't, 2 streets.....	F. H. Raub, City Engr.
New York.....	Brooklyn.....	May 8, 11 a.m.....	Constrn. sidewalks, asphalt pav't, etc.....	A. E. Steers, Boro. Pres.
New York.....	Brooklyn.....	May 9, 3 p.m.....	Furn. 80,000-gal. macadam asphalt binder.....	C. B. Stover, Pres. Park Dept.
Texas.....	Galveston.....	May 9, noon.....	Grad. streets.....	V. E. Austin, Comm.
Indiana.....	Peru.....	May 9, noon.....	Constrn. roads.....	F. K. McElheny, County Aud.
Ohio.....	Painesville.....	May 10, 10 a.m.....	Constrn. 1.41 miles bituminated concrete.....	County Comm.
West Virginia.	Glendale.....	May 10, 2 p.m.....	Pavg. Wheeling avenue.....	J. E. Chane, Clk. County Court.
Ohio.....	Youngstown.....	May 11, 10 a.m.....	Constrn. 1.29 miles macadam.....	County Comm.
New York.....	North Tarrytown.	May 15, 8 p.m.....	Constrn. 2,815 ft. brick pav't.....	Wulff Engr. Co.
Washington...	Montesano.....	May 20.....	Imp. State road No. 9.....	R. G. Trask, County Aud.
New York.....	Newburg.....	May 20, 5 p.m.....	Resurf. with bitulithic.....	W. J. Blake, Jr., City Engr.
Indiana.....	Fowler.....	May 21, 11 a.m.....	Constrn. gravel roads.....	L. Shipman, County Aud.
Rhode Island..	Providence.....	May 29, noon.....	Constrn. 30 miles State road.....	State Board Public Roads.
			SEWERAGE	
Pennsylvania..	Hazleton.....	May 3, 4 p.m.....	Constrn. concrete sewer.....	B. E. Youngman, City Engr.
Pennsylvania..	Chester.....	May 6, 8.30 p.m....	Constrn. sewers and water connections.....	Wm. Provost, Jr., Chm. Comm.
Pennsylvania..	Everson.....	May 6, 8 p.m.....	Constrn. 16,000 ft. of 8 to 12-in. sewers.....	Robt. Gove, Boro. Clk.
New Jersey...	Jersey City.....	May 6, 2 p.m.....	Constrn. 18-in. sewer.....	E. B. See, Clk.
Dist. Columbia	Washington.....	May 24.....	Constrn. water & sewer connections at Indian School, Colorado River, Ariz.....	Indian Office.
			WATER SUPPLY	
New York....	Brooklyn.....	May 8, 2 p.m.....	Clean. water mains and furn. Venturi meter, etc.....	H. S. Thompson, Comm.
Oklahoma.....	Wagoner.....	May 14.....	Constrn. electric light plant and water works extensions....	City Clerk.
North Carolina	Reidsville.....	May 21, 8 p.m.....	Constrn. 5½ miles wood pipe, filter plant and pump. station.	Francis Womack, Mayor.
			LIGHTING AND POWER	
Pennsylvania..	Dormont.....	May 10, 6 p.m.....	Furn. elec. current for 10 years; also supplies.....	P. H. Johnston, Chm. Comm.
			FIRE EQUIPMENT	
New Jersey...	Hackensack.....	May 6, 8.30 p.m....	Furn. 500 ft. 2½-in. fire hose.....	A. W. Gedney, Clk.
Connecticut...	Bridgeport.....	May 15, noon.....	Constrn. engine house.....	Board of Contract.
Kansas.....	Wichita.....	June 3.....	Constrn. fire and police telegraph system.....	Wm. Sence, City Clk.
			BRIDGES	
Ohio.....	St. Clairsville....	May 6.....	Constrn. 2 concrete bridges.....	E. Campbell, County Aud.
Alabama.....	Decatur.....	May 7, 8 p.m.....	Constrn. 2 concrete bridges.....	H. A. Skeggs, Mayor.
			MISCELLANEOUS	
Pennsylvania..	Pittsburgh.....	May 7, 11 a.m.....	Constrn. underground conduits.....	W. G. McGee, Mayor.
New York.....	New York.....	May 8, 10 a.m.....	Furn. 6 motorcycles.....	R. Waldo, Police Comm.

STREET IMPROVEMENTS

St. Petersburg, Fla.—City Council has passed the resolution to ask for a bond issue of $22,000, the major part of which is desired for street and waterfront improvements.

Boston, Mass.—Bill, which has passed Senate, provides that Boston Street Commissioners, with approval of Mayor, may widen, extend and reconstruct Avery st., between Washington and Tremont sts.

Detroit, Mich.—Movement has been started for improvement of Michigan ave.

Grand Rapids, Mich.—Proposal of extending street paving on Plainfield ave., from Quimby st. to Ann or Knapp ave., is being discussed.

Sedalia, Mo.—At special election, proposition to issue $200,000 in bonds to build 52 miles of rock roads in Sedalia 12-mile road district carried by vote of 2,894 to 360. That is said to be largest bond issue by Road District in Missouri.

Butte, Mont.—City Council has decided to co-operate with "city beautiful" committee of Chamber of Commerce in parking certain portions of North Montana st.

Amsterdam, N. Y.—State Highway Commission, of which State Engineer Bensel is chairman, has given its approval to plan to pave West Main st. with fire clay brick in accordance with resolution passed at meeting of Common Council and in accordance with State highway law which makes State liable for half cost; estimated cost, $100,000.

Cleveland, O.—City will adopt tar-concrete system of road building for its city parks and plans to build about six miles this summer.

Dayton, O.—City Council has passed ordinance for oiling of unpaved streets of city in conformity with recommendation adopted by committee.

Dayton, O.—Paving of Eagle st. is being discussed.

Dayton, O.—Resolution asking for paving of Findlay st., from Fifth st. to First st., has been passed; also other resolutions as follows: For improvement by paving of Springfield st., May st. and Hollencamp ave., from Jefferson st. to Warren st.

Harrisburg, Pa.—State Highway Commissioner E. M. Bigelow has announced invitations for bids for construction of first six sections of roadbuilding to be undertaken as part of this year's building program, bids to be opened during third week of May. The list includes: Section 17, National rd., Washington County; Section 1, main highway route No. 1, Susquehanna Township, Dauphin County; Section 3 on route No. 238, Hickory Township, Mercer County, and portions on the following routes: No. 246, Westvale, Allegheny County; No. 47, East St. Clair Township, Bedford County, and No. 26, Buffalo Township, Union County.

Scranton, Pa.—Ordinances have been passed providing for paving of various streets.

York, Pa.—Following ordinances have passed first reading: Authorizing grading and repairing of East Philadelphia st., from Hartman st. to Harrison st; authorizing repairing of Union alley, between Newberry st. and Garfield school house.

Bristol, Tenn.—First National Bank of Bristol has purchased the $200,000 issue of Sullivan County road bonds. Bonds were advertised and bids opened some time ago, but none was as high as par.

Morristown, Tenn.—Election to ascertain sentiment of citizens of Hamblen County, on proposition to issue county bonds for purpose of repairing pike roads of the county will be held shortly.

Dallas, Tex.—Committee of petitioners from Oak Cliff have asked that Eighth st. be paved from Marsalis to Starr ave. and that Starr ave., from Seventh to Ninth st. be graveled. Commissioner has taken matter under advisement.

Fort Worth, Tex.—County Judge Bratton and County Clerk Bevers have signed bonds authorized for building of roads and bridges in Tarrant County, $1,600,000 in amount.

Houston, Va.—The Banister road district has in contemplation calling of election for bond issue for roads.

Richmond, Va.—Campaign to raise $100,000 for proposed Richmond-Washington highway will be started. Soliciting committees hope to complete work in four days.

Staunton, Va.—Election will shortly be held for voting on proposed $1,000,000 bond issue for roads in Augusta County.

Rosalia, Wash.—Resolution urging that proposed cross-State highway be routed through Spangle, Rosalia and Colfax, from Spokane, has been adopted by Rosalia Chamber of Commerce.

Chester, W. Va.—A $125,000 Grant district road improvement bond issue has been sold to Hayden Miller Co., of Cleveland, O.

CONTRACTS AWARDED

Bay Minette, Ala.—To Bay Minette Concrete Co., Bay Minette, for construction of several blocks of sidewalks.

Hemet, Cal.—For constructing cement curbs and sidewalks on three miles of streets, to Star Cement Co., Riverside, Cal., at $90,000.

Bridgeport, Conn.—To Burns Co., Lindley st., Bridgeport, at $1.39 per sq. yd., for 1,500 sq. yds. of wood block pavement.

Chatham, Conn.—To Pierce Engineering & Construction Co., Bristol, at $7,150, for building 1¼ miles of new highway.